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FREIGHTS ON THE GREAT LAKES.

ROCKEFELLER VESSELS A PRIME FACTOR IN THE SITUATION—ENORMOUS INCREASE IN ORE SHIPMENTS.

It has been said repeatedly in these columns since October last, when some eighteen millions of vessel capacity was placed under contract to move iron ore during the present season, that the key to lake freights on grain and ore not covered by contracts was held in the office of the Bessemer Steamship Co.; that John D. Rockefeller's representatives, controlling the great bulk of the vessel capacity that is not under contract, had it within their power to hold the "wild" rates up to contract figures, or far above the contract rates if business conditions warranted an increase over those rates. It was also said that a natural move in this direction would be the tying up of a large part of the capacity controlled by the Rockefeller interest. The freight situation since the opening of navigation has been somewhat against the vessels that are not under contract. Any force of Rockefeller tonnage on the market for grain or ore for which the ships were not contracted would make the situation worse. Developments of the past few days certainly indicate that this tonnage is not to be forced upon the market. Rumors of large numbers of the vessels being assembled and held in ordinary have been freely circulated in all parts of the lakes, but there is no definite information on this score, as Mr. Rockefeller's representatives are as usual keeping their own council in the matter. It is plain, however, that the vessels of the Bessemer company are being handled with a view to upholding freights. The effect thus far has been general improvement in a freight market that would certainly have gone the other way if it were not for the surplus tonnage being held by one interest.

The influence of this element in the market is the more remarkable when the enormous movement of freight on the lakes thus far this season is taken into account. Reports from the Sault canals show a total freight movement to June 1 that is 37 per cent. in excess of what it was on the same date a year ago. A large part of this gain is, of course, due to the earlier opening of navigation—two weeks in advance of last year. The increase extends to practically all lines excepting grain. More wheat was moved from Lake Superior than to June 1 of last year, but if corn and other cereals are taken into account, the grain movement as a whole is thus far a little short of 1899.

Reports from the ore shipping ports regarding the movement to June 1 are sufficiently complete to indicate an increase of fully a million tons. This is an enormous gain at the outset of the season, especially when it is considered that on June 1, 1899, there was a shortage compared with 1898, but it would be well to note also that the May movement of ore this year may possibly be equal to the output of any month in the season. Everything in the way of ore shipping facilities—docks, cars and mines—was primed up for heavy shipments as soon as the ore began moving. The preparations for a great output at the beginning of the season were such as had never been made before.

END OF UNION DRY DOCK STRIKE—BUFFALO MATTERS.

Buffalo, N. Y., June 6.—After lasting eighteen weeks and beating both the men and the company out of thousands of dollars of business, the strike of the Union Dry Dock Co.'s workmen has ended with the men substantially where they were at the outset. There has been no little loss to innocent parties, of course. The Union Transit Co. has this week brought out the steamer Portage, which is the third of the line that had to go to Tonawanda to have work done on boilers. These steamers were boycotted here on account of having had some work done in the Union yard and so they went down the river and patronized a non-union yard. The Portage has lost more than a month by the strike. Package freight business is running down steadily, both east and west bound, but there is no rate cutting except west of the lakes.

Somebody at Montreal has been giving the Conners syndicate and the St. Lawrence grain route a new black eye by riddling the estimates of profits to be made by vessels in that route, but even he did not cover the ground very well, spite of his zeal in the cause. For instance he did not touch the estimate of 85,000 bushels that is to be carried by a vessel, when it is well known that the 14 feet draught is often cut down to 13½ feet at Port Colborne lock, which means a cargo of not more than 60,000 bushels of wheat, an actual cut down to a small fraction over 70 per cent. of the Conners' estimate. We are not at all afraid of the northern route and have not been.

When it comes to speaking of inroads in the Buffalo grain business made of late by Erie and some of the Ohio ports it appears to be another thing, for there is apparently the very best of reason for a continuation of the old lead in this business. The rail rate is lower than ever before and the canal rate to correspond, so that when wheat is 1½ cents from Chicago the canal and a cut-rate elevator will carry a bushel all the way to New York for less than 4 cents, something hardly possible by any other route. Our marine men are saying that it is the fear of strikes that has done the mischief, but that is a groundless fear. The grain handlers have behaved much better than the average workingmen, here or elsewhere. Time will have to tell what is the matter.

The long-delayed activity in steel-plant development is over. There is more land bought and activity is so plain to all that the croaker, who was ready to make his speech when the plant was side-tracked by selling out to some other combination, has had to go into other business. The Pennsylvania Railroad is also buying land in the same vicinity and we shall soon have another marine, manufacturing and railroad city just over the city line.

JOHN CHAMBERLIN.

While it is too early to obtain the facts in the case, there is reason to believe that owing to the failure of the conference committees to agree several of the items relating to the improvements of rivers and harbors have been left out of the sundry civil bill.

VISIT OF CONGRESSMEN TO THE LAKES.

A meeting of members of the Lake Carriers' Association will be held in Cleveland, Friday, to consider a plan devised by Messrs. Farrington, Keep and other executive officers of the association for the entertainment of members of the rivers and harbors committee of the house of representatives when they visit the lakes in August for the purpose of examining government works and becoming acquainted with the conditions under which commerce is carried on. Of course the plans are not definite as yet, but it is proposed to have the party leave Buffalo about August 8 or 9 on one of the large side-wheel steamers of the Cleveland & Buffalo line. Entertainment will be provided in Buffalo before departure. If possible a day would be given to stops at Erie, Conneaut and Ashtabula, but if one of the large steamers can not be secured for this kind of trip, the party would reach Cleveland on the morning of the 10th after the ordinary night run from Buffalo. They will spend August 10 in Cleveland, where no doubt the chamber of commerce will look after their welfare. On the evening of the 10th they will leave on the Detroit boat for Detroit, arriving at Detroit on the morning of the 11th, and remaining in Detroit until about 3 p. m. They will then take the steamer North Land from Detroit, arriving at Mackinac the following morning, August 12, having an hour and a half there for a drive around the island. Reaching the Sault about 6 p. m. the same evening, they will have nearly three hours of daylight at the Sault. The North Land will change the schedule for that trip, and instead of reaching Duluth on the following day at about 8 or 8 p. m., will make the trip through the Portage canal, arriving at Hancock by 9 o'clock August 13, and remaining there about three hours, giving opportunity to see portions of the Calumet & Hecla plant and arriving at Duluth the same evening about midnight.

This plan will give the party the day of starting in Buffalo, and possibly a day in which to visit Erie, Conneaut and Ashtabula; a day certainly in Cleveland, the following day in Detroit, time for a drive at Mackinac, three hours to see the sights at the Sault, an opportunity to visit the copper mines, and daylight rides through the upper Detroit river, St. Clair river, St. Mary's river and the Portage canals. Returning they make the trip on the North West or North Land, taking the boat immediately back and running on regular schedule time, or stopping at Duluth for the next boat in case the iron ore companies want to take them up to the mines, as they have heretofore talked of doing. The lower Detroit river will be run by daylight on the return trip.

CANADA NATIONAL RAILWAY & TRANSPORT CO.

A bill has been introduced in the parliament at Ottawa to incorporate the Canada National Railway & Transport Co. The author of the bill is Archibald Campbell. The list of incorporators given in the bill are: F. S. McKinnon, wholesale merchant, John Ryan, contractor, McDowell Thomson, barrister, of Toronto; A. L. Wood, M. P., wholesale hardware, Hamilton; James McMillan, M. P., banker, Mount Forest; George Landestein, M P., Hanover; Archibald Campbell, M. P., Toronto; John Wilson, Fred Thomas Hodgson and David Wilson, Collingwood, Ont.; John Geddes Keith, Chicago; George Grenville Barnum and William Buchanan, Duluth, Minn.; Frederick Kraus, Milwaukee, Wis.; George Frank Piper, Minneapolis; John Buchanan McColl, Toronto, Ont.; William James Hill, Deer Park, Ont.; George Henry Breyman, Toledo, O.; George Parry Graham, Brockville, Ont.; Robert Cumming Stewart and John Henry Boyle, Toronto.

The company is to be capitalized at $5,000,000 and its purpose is to construct a railway from Toronto to Collingwood. Mr. Archibald Campbell, writing to the Review, regarding the enterprise says:

"The company is applying for a charter to build an air line railway from Toronto to Collingwood, a distance of 70 miles, with eight large steamers of 20 foot draught on the upper lakes and thirty-two steamers of full canal size on the lower lakes. The plans are instead of sending the grain from the great west down the Detroit river and Lake Erie and thence through the Welland canal to send it to Collingwood and then transport it over the 70 miles of railway to Toronto and then load it on the smaller boats which will take it to Montreal. This route will shorten the distance from Cockburn Island (the common diverging point) some 375 miles to Montreal over the Welland canal route and will avoid the dangerous route down the Detroit river, as well as about 24 hours' time getting through the Welland canal. The railway will be double track 100-pound steel rails and will be equipped with steel cars capable of carrying from 1,500 to 2,000 bushels of grain, constructed with hopper bottoms so that by keeping the tracks elevated a little at Toronto the grain will run out either into the vessel or elevator with the least possible expense. By this route to Montreal there would be only 70 miles of railway and 46 miles of canal. Comparing it with the Buffalo route we reach Montreal by covering 580 miles (70 of which are rail and 46 canal), whereas to reach New York it is 1,130 miles, 500 of which is canal or rail."

The bill authorizes the company to construct and lease docks, storehouses and elevators and to construct and charter steam vessels and to operate them in connection with its railway.

The Philadelphia Commercial Museum has just issued a little bulletin containing conversion tables of weights and measures and foreign moneys. It was compiled with a view of providing means for the easy conversion of money, weights and measures used in the United States to those used in the principal commercial countries. American manufacturers frequently make the mistake of quoting in their own money and measure. Pounds, yards and gallons have about the same significance to the foreign merchant as the pood, catty, pund, caudra and fanega have to the American merchant.

The Alliance will shortly be sent to the New York navy yard where she will be equipped with new boilers. The department will use for this purpose two boilers taken out of the Atlanta.

THE PRACTICAL RESULTS OF SOME INNOVATIONS IN MODERN SHIP BUILDING.

BY HENRY B. WORTLEY, MEMBER INSTITUTION OF NAVAL ARCHITECTS.*

It may be of interest to the members of this institution to lay before them the results of some departures from ordinary merchant ship building practice, which have been embodied in eleven steamers owned by the Ocean Steamship Co. and managed by Mr. Alfred Holt. These vessels, like all their predecessors in the line, are unclassed. Their moulded dimensions are 440 feet by 52½ feet. They carry 8,200 tons of dead weight on a draught of 25½ feet, the freeboard having been assigned by the British corporation for the survey and registry of shipping. The profile is shown in Fig. 1, where it will be observed that the upper deck has no sheer; though, for the sake of eye sweetness, a slight sheer has been given to the bulwark rail. The engines in normal condition indicate 3,600 H. P., giving a continuous sea speed of 13 knots. Three of these vessels have now made two round voyages from this country to China and Japan, each covering a total distance of about 50,000 miles, and two of them have started on a similar maiden voyage of about 25,000 miles.

Amongst the innovations are the following: External—A rudder so hung that no stern frame has been required, and allowing the after deadwood to be cut away. Internal—The substitution in the main hold of two pillars in place of the usual numerous stanchions; a 3-foot frame spacing; the disuse of cement on the ship's bottom inside the ballast tanks. The stern frame of a merchant steamer is a feature which still retains to a large degree its primitive form and section. It has varied but little since its introduction into iron ship building, and probably it had more arguments to justify its inception than can be claimed for its retention today. When introduced it was small in weight, size and section, easy to forge, and formed a convenient method for finishing the run of a small ship. Since then the sizes of ships have gradually increased, and the stern frame has steadily advanced in weight, size and section, until at the present time it is quite common to have stern posts of 20 tons weight and 13 inches by 8 inches of rectangular section. It is needless to say that these posts are very clumsy to handle, even though scarphs have been introduced, and, despite the care bestowed in the manufacture, the results are not always satisfactory. The commendable action taken by Lloyd's in the early eighties, in appointing specialists to survey forgings during the process of manufacture, and the circular issued in 1886 requiring all sections above 40 square inches to be welded under the steam hammer have done much to minimize the evil; but it is not yet cured. Cast steel was introduced for stern frames and rudder in the hope of overcoming bad welds, but a reaction has taken place against the use of this material, as many ship owners have had unfortunate experiences of contraction flaws, necessitating the removal either of partial to complete stern frames and rudders. The rectangular section of stern frame is most commonly used, although in some few of the largest vessels—especially twin-screw steamers—a U-shaped section of cast steel has been adopted for the inner post, while the aperture portion of the outer post has been retained of rectangular section.

Now the strength of a stern frame of rectangular section is incompatible with the weight involved. Whether considered as a girder or pillar the section is most primitive, and the number of broken stern posts constantly seen do not justify them as being simple things to manufacture, or fitting contrivances for ending the after body lines. When broken no other part of a ship of equal weight is so costly to repair, or requires so long a period for renewal. The form renders it incapable of being incorporated with the framing of the ship at reasonable cost, excepting at the transom, and at the upper portion of the inner or propeller post. Its whole weight is therefore sandwiched between the comparatively thin end plates of the shell, to which it is attached by a multitude of long rivets of a large diameter. The number of slack rivets observed in the after deadwood and the number of stern frames broken just below the boss, clearly show that a considerable deflection takes place in thin deadwood during the ordinary working of the ship. The deadwood of the sailing ship has definite reasons to justify its existence, but it is difficult to find an excuse for deadwood in steamers. Its weight is generally greater than its buoyancy, it probably interferes with the efficiency of the propeller to an appreciable extent, and it certainly tends to prevent rapid maneuvering.

Most ship owners have experienced in greater or less degree the foregoing disadvantages of the ordinary forged or cast steel stern frame and rudder; and many agree that the present type of stern is "found wanting." With a view to overcoming these difficulties the following guiding principles were laid down for designing a stern and rudder for vessels of the Ocean Steamship Co.'s fleet: That there be no useless after deadwood; that a support at the heel of the rudder is not essential; that forgings and castings be reduced to a minimum; that the frame terminating the run of the vessel be compatible with the adjacent scantling; that the frame be thoroughly incorporated with the ship's structure; that the rudder be of the balanced type. Several designs were made to meet these requirements, but the one illustrated in Fig. 2 was finally chosen. It will be noted in the diagram that the after end of the rudder was 8 inches thick, and forms the termination of the water lines above the propeller arch. This gives a much longer and cleaner run to the vessel than is possible when the lines terminate upon the ordinary stern post. The greatest advantage, however, lies in the increased thwartship width that these lines give to the stern, as it enables the requisite strength to be obtained from material of much less weight than the ordinary form of stern frame. The increased space also gives easy access to every rivet in the structure. In this case the stern post is made of a wrought iron tube of 21 inches external diameter and 1 inch thick, with an internal liner at the lower part of the same thickness. The lower part of this tube forms the bottom pintle for the rudder. The propeller arch is made of a Siemens-Martin steel plate 1 inch thick, of U-shaped section. The after part of it is riveted to the sides and also the front part of the stern tube; and the forward part is carried down to the boss and riveted thereto. The boss is a steel casting—the size of which has been reduced as much as possible. It has one palm on the top riveted to the extension of a water-tight flat, and another at the fore end of its lower part riveted to the after-peak bulkhead. It will

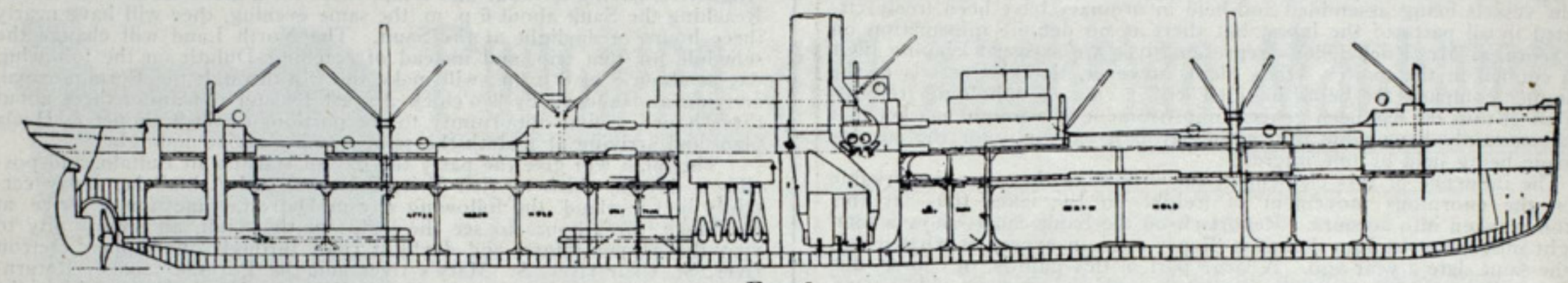

FIG. 1.

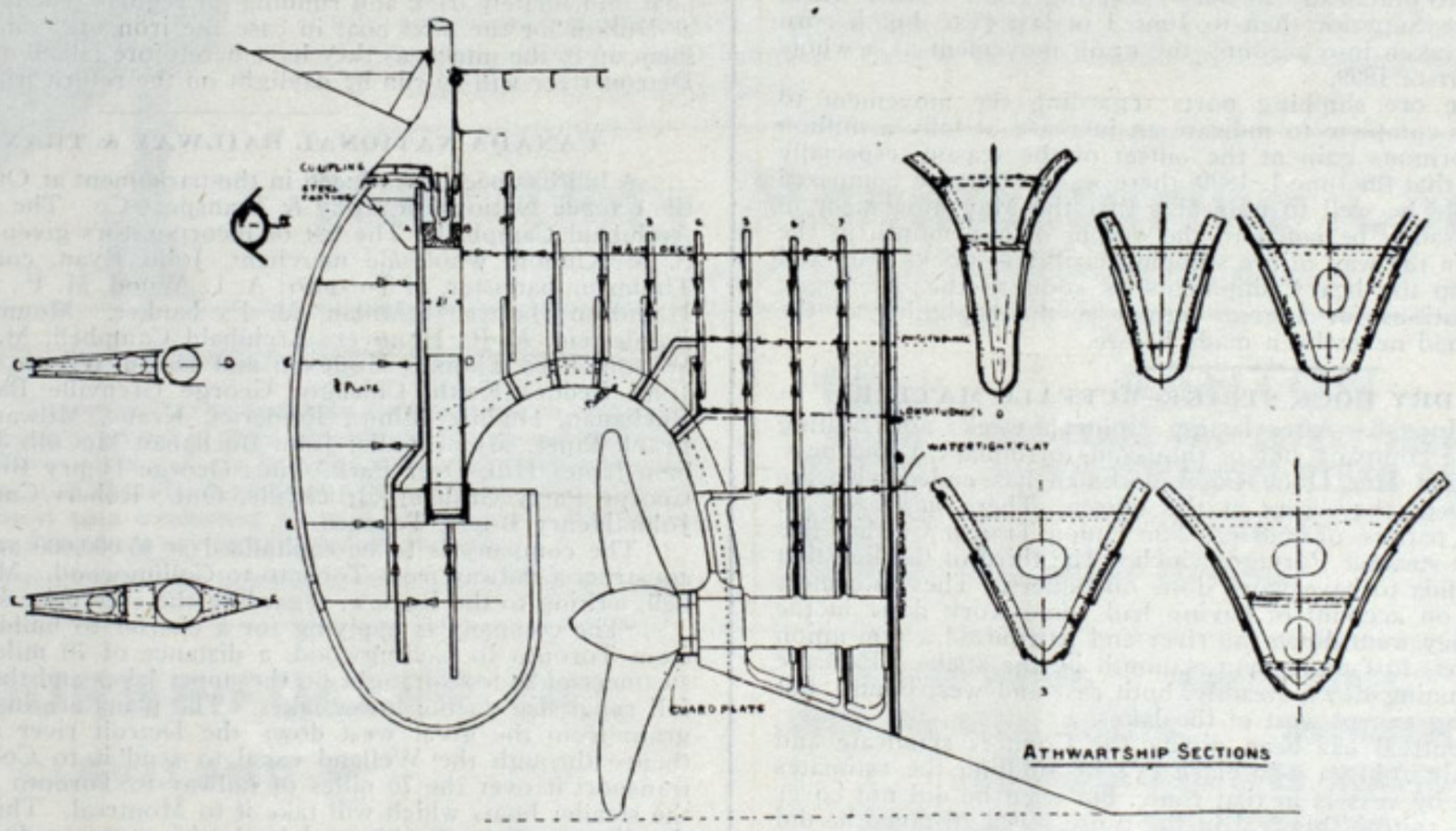

FIG. 2.

*Read at last annual meeting of Institution of Naval Architects, London.

be noticed in the diagram that the framing of the ship is incorporated with every portion of the stern. The frames above the arch plate are directly connected thereto, and two of the longitudinals are also incorporated with it. The top of the stern-post tube has an attachment to the main deck, and the bottom of it is well supported by the after sides of the arch plate. The base of the sloping part of the deadwood is formed by an extension of the keel plate. The rudder, as will be noted, is built of plates and bars, and the interior is accessible in every part. The bow frame is of channel steel, and a flat bar at the fore side finishes the lower part of the rudder. The socket in the rudder for the lower pintle is of Siemens-Martin steel, lined with white metal working upon the lower part of the stern post tube. At the head of the rudder is a small steel casting, with flanges forming a coupling for bolting it to the lower part of the forged iron rudder stock, which is of ordinary form, excepting that it passes through an octagonal eye in the casting just described, and forms an additional safeguard for working the rudder in case of accident to the coupling bolts. The lower part of the forged rudder stock forms the top pintle, and is housed in a cast socket fixed into the top end of the stern post tube, where the whole weight of the rudder is taken. It will be observed that this form of rudder is easily made watertight, and, therefore, buoyant, the effect of which is to reduce the weight on the top pintle, which takes the downward thrust. The total weight of the rudder, rudder stock,

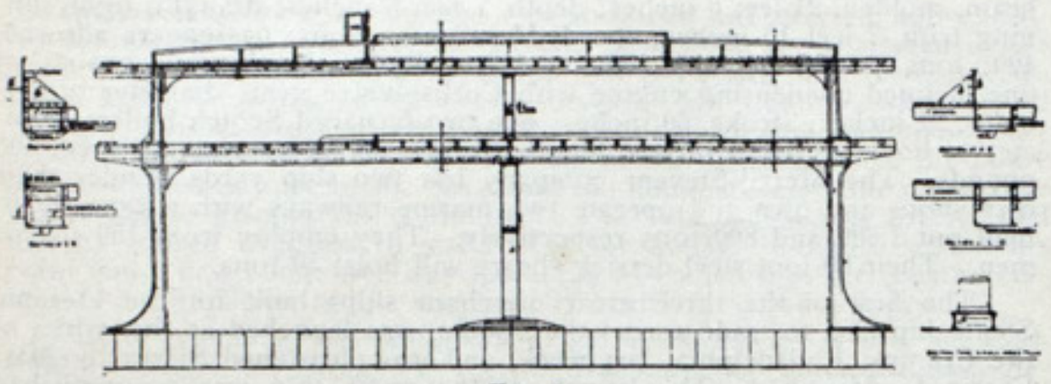

FIG. 4.

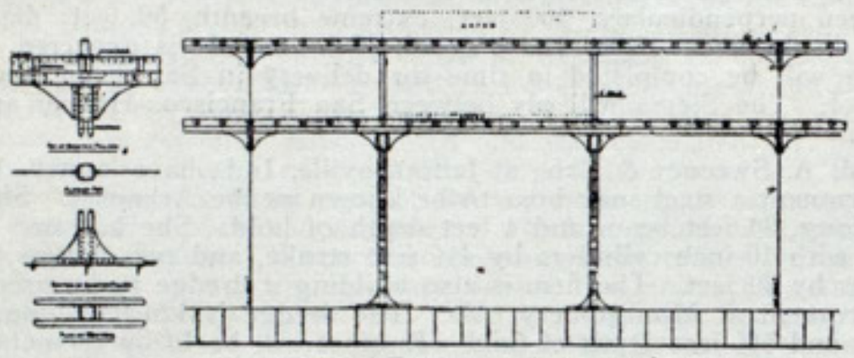

FIG. 5.

tiller, etc., is about 15 tons, and the buoyancy of the rudder at the load draught is about 5 tons, leaving a downward thrust on the top pintle of 10 tons. The total weight saved in this system of constructing the stern against the ordinary type is about 10 tons.

In the initial stages of the design the chief argument brought against the system was that it would prove to be a trap for ropes and fishing nets. To prevent a rope or fishing net plugging the water grooves in the tail shaft bearing a guard plate was fitted over the stern post boss, as shown in Fig. 2; but, although these steamers have covered collectively nearly a quarter of a million miles, no such difficulty has as yet been experienced. A trial of the maneuvering powers of one of these vessels was made in the Firth of Clyde in a dead calm and slack water. The vessel's draught was 18 feet aft and 14 feet forward. A long run was just being completed at 4,000 I. H. P., which gave a speed of 14 knots. The helm was then put hard a port, and the diameter of the first half of the turning circle was found to be 1,170 feet and the second half 1,070 feet. The time occupied in turning the complete circle was 5 minutes 17 seconds. It was anticipated that the abolition of the after deadwood would tend to increase the maneuvering powers of these vessels to a considerable extent, but it was also feared that it might produce unsteady courses. To avoid this the vessels were fitted with bilge keels of rather greater length than usual, viz., 250 running feet on each side. As a result, the pilots and masters of vessels report that they are easier to handle than steamers in the fleet of one-third their size, and that they make excellent courses.

SUBSTITUTION OF TWO PILLARS FOR ORDINARY STANCHIONS.

The ordinary system of pillaring cannot be said to have many arguments to justify its existence. For a ship builder it is a crude and primitive contrivance, for the ship owner a costly nuisance; and in the performance of its functions it is more remarkable for its weight and obstructiveness than its strength. In text books pillars are usually described as "short" and "long," in terms of their diameter, but in modern ships without lower, or orlop decks, a new superlative would have to be invented to adequately describe the pillars now in general use. As they are of great length and have little resistance to traverse pressure, great difficulty exists in keeping them straight. Obstructing the stowage, they form a first aid to the stevedores in chocking off cargo; and, as this is usually done with wedges, the pillars very frequently get bent. It, therefore, happens, even in the best regulated fleets, that a considerable percentage of the pillars are useless, either as struts or ties, their resistance to deflection is also considerably modified by the character of their ends, and their value in many cases might be increased by greater attention to this detail. But, perhaps, the chief advantage of the ordinary system of pillaring occurs in vessels of great breadth, especially when quarter pillars are introduced. They break the stowage of the hold to such an extent that the obstructing pillars must frequently be removed to admit bulky cargo, and very often they cannot afterwards be replaced until the cargo is discharged. Under these circumstances, the deck is usually shored with wooden stanchions from the hold ceiling, and in some cases, where this is not accessible, the only alternative is to shore the deck from the cargo, in which case care must be taken to get a solid foundation for the stanchions and to secure the cargo from damage. Such shores can only perform one of the two functions of a ship's pillar. They cannot easily be made into ties as well as struts. It is not surprising, therefore, that many cases are on record where these temporary shores have got adrift while the ship has been working in a seaway, thus causing the decks to collapse. Similar accidents to the deck are on record where the pillars have been carelessly replaced or left out altogether. Many accidents can also be traced to the negligence of leaving bent pillars unstraightened.

Now, in order to develop the full strength of a ship, it is imperative that the top and bottom members of its girder should be rigidly tied together. It is also desirable, from the ship owner's point of view, that the number of pillars should be reduced to a minimum, and, if possible, the danger should be overcome that is caused by careless tampering with portable pillars, thus compromising the strength of the ship. Their diminution would also effect a considerable saving in time and money, which is generally incurred by the removal and replacement of portable pillars for the admittance of bulky cargo.

To achieve this end the main hold, shown on Fig. 4, was designed early in 1895, and has since been introduced into fifteen steamers of this fleet. The length of the hold is 75 feet, and it contains, with the 'tween decks, 2,650 tons of space, and yet its only obstruction is one pillar on each side of the hatchway. The floor of this hold has contained as many as twelve Lancashire boilers, each weighing 29 tons, which have been stowed without the removal of any part of the ship's structure. It may be of interest in passing to state that the lifting appliances at this hold have been tested up to 35 tons. The principle adopted is that of compensating for two complete rows of stanchions, by fitting two accessible box girders under the main deck, extending the upper deck hatch coamings from bulkhead to bulkhead. The hatch coamings are converted into girders by fitting efficient flanges on the upper side, while the lower side is reinforced by fitting two channel girders under the upper deck beams. These fore and aft girders are divided into two spans, the extreme ends of which are supported by specially stiffened bulkheads, and the center by a built pillar, the thrust of which is taken by a special stool fitted to distribute the stress over the double bottom. This system has been perfectly successful, experience proving it to be more rigid than the ordinary system of pillaring. It is a pleasure to record that Messrs. T. & J. Harrison of Liverpool have fitted this system in a slightly modified form into two of their largest steamers, and have carried it throughout the length of the ship. It may be added that these two vessels were classed at Lloyd's. Messrs. Harland & Wolff have adopted the system and have fitted it right fore and aft in five large vessels built for the Australian trade and owned by the White Star Line.

In the vessels forming the subject of this paper it was considered sufficient for the trade in which they were employed to fit one hold in the manner just described, and unnecessary to fit girders of such large spans in the remaining holds. However, to prevent any discontinuity of strength the main hold girders on both decks were carried right fore and aft, scarphing into the engine and boiler casing; but, as a less span was adopted in the remaining holds, the girders were made of a lighter character. This system is fully illustrated in the after main hold, Fig. 5. The result of this system of pillaring has been most satisfactory, there being a complete absence of vibration, even when the vessels are in their lightest trim, and at all speeds of the engines up to a piston speed of 950 feet per minute.

When the main holds of these vessels were designed, it was predicted

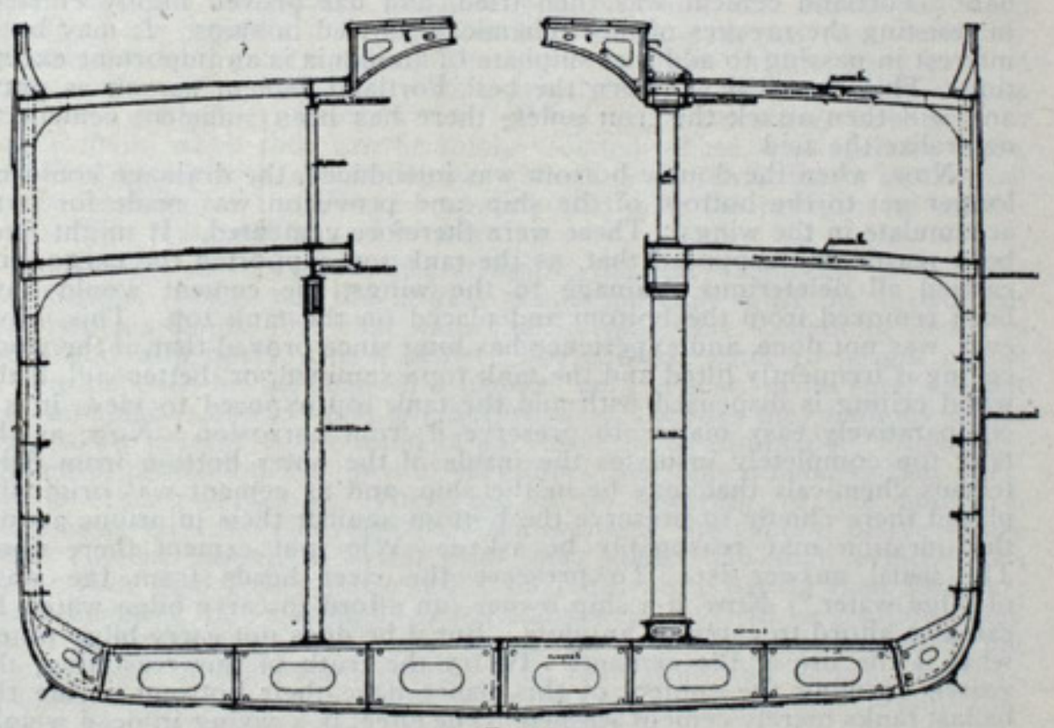

FIG. 6.

by some opponents of the scheme that it would be impossible efficiently to chock the cargo to prevent chafage, owing to the absence of pillars, and that there would be heavy claims for damaged cargo. The contrary has been found to be the case, and experience has proved that these holds carry cargo with even fewer claims for chafage than vessels fitted with the ordinary system of pillaring. In other words, experience has shown that stanchions really tend to cause chafage.

THE THREE-FEET FRAME SPACING.

In these vessels a 3-feet frame spacing has been adopted. An increase in this direction has frequently been urged in times past, but the writer has been unable to discover any precedent in the merchant service where a greater spacing than 30 inches has been adopted. In a highly interesting and instructive paper, read before this institution so long ago as 1873, Sir William White, in one of his conclusions on transverse framing, says: "It appears that an increase in the spacing of transverse frames favors the more satisfactory development of the strength of the skin plating, without any increase in cost of workmanship or weight of material. A change in this direction has been repeatedly enforced on weightier grounds than the above, but has long been postponed. There can be little doubt, however, that nothing but advantage, so far as strength in proportion to weight of hull is concerned, would result from modifying the present system of framing, widening the frame space, and combining with

the reduced transverse framing some well-considered system of longitudinal framing."

Were it not for the fact that we have had repeated examples of the distrust of change common to ship owners, ship builders, underwriters and registration societies it would appear inexplicable that such an admirable paper, so logical and conclusive in its deductions, should have lain without actual result for so many years. This is more remarkable still when it is considered that the practical advantage of a wider spacing of frames is shared alike by ship builder and ship owner. The reduction in the number of frames, reverse frames, floors, frame brackets, and, it might also be added, beams, coupled with the enormous reductions in the number of rivets used in the ship and the greater accessibility of every part, especially the ballast tanks, are matters of advantage to builder and owner alike. They appeal especially to the ship owner, because, with a given weight, a stronger and more durable ship can be produced.

The durability of steel ships has been much discussed owing to their scantlings being 20 per cent. thinner than iron. It has also been remarked of steel that the last stages of corrosion are more rapid than the first. This is undoubtedly due to the wasted material vibrating and throwing off all applications of anti-corrosive covering. If this is to be avoided, it follows that, instead of having a large number of comparatively thin scantlings easily wasted to the vibrating stage, it is better to have fewer and thicker parts which will give greater initial strength, with the same weight, and be more durable in the end. The midship section of these vessels showing the general scheme of scantlings, is given in Fig. 6. It will be noted that an attempt has been made to combine with the 3-feet frame spacing a simple longitudinal system. The ship's side is divided into cells about 4½ feet by 3 feet, the longitudinals keeping every portion of the shell and framing well up to its work. The fore-and-aft girders, compensating for the omission of ordinary pillars, are also valuable longitudinal stiffeners to the upper flange of the ship-shaped girder. None of the objections urged against the wider frame spacing have been experienced in practice. The ships have met with all kinds of weather, and have stood both the pounding and hammering action of the sea with impunity. In port and roadsteads they are constantly surrounded by barges inflicting the usual amount of bumping. They also meet with the usual fendering when entering locks or coming alongside quays. After considerable experience of this usage there is absolutely nothing to indicate in any of these vessels that the 3-feet frame spacing is in any way inferior to the 2-feet spacing for resisting the local shocks that ships are subject to. It has now been adopted in this fleet of steamers as the minimum spacing.

DISUSE OF CEMENT ON THE SHIP'S BOTTOM INSIDE THE BALLAST TANKS.

It was not until considerable experience of iron ships had been gained that Portland cement was adopted for preserving the inside of their bottoms. For some time this part of the ship suffered more severely from corrosion than any other. This was largely caused by the acids in the cargo draining into the bilges and setting up a chemical action detrimental to the iron. At that time sugar formed a staple trade for many iron ships, and the effect of this cargo on their bottoms was found to be most destructive. Asphalt was at first adopted to insulate the iron from these ravages, but was found to soften in warm climates, and run down toward the center of the vessel, leaving the higher parts and rivet heads bare. Portland cement was then tried, and has proved highly efficient in resisting the ravages of most chemicals carried in ships. It may be of interest in passing to add that sulphate of ammonia is an important exception. This chemical will turn the best Portland cement as soft as putty and will then attack the iron unless there has been sufficient cement to neutralize the acid

Now, when the double bottom was introduced, the drainage could no longer get to the bottom of the ship, and provision was made for it to accumulate in the wings. These were therefore cemented. It might have been reasonably supposed that, as the tank top supported the cargo, and carried all deleterious drainage to the wings, the cement would have been removed from the bottom and placed on the tank top. This, however, was not done, and experience has long since proved that, if the wood ceiling is frequently lifted and the tank top examined, or, better still, if the wood ceiling is dispensed with and the tank top exposed to view, it is a comparatively easy matter to preserve it from corrosion Now, as the tank top completely insulates the inside of the outer bottom from deleterious chemicals that may be in the ship, and as cement was originally placed there chiefly to preserve the bottom against their injurious action, the question may reasonably be asked: Why put cement there now? The usual answer is: "To preserve the rivet heads from the wash of bilge water." Now, if a ship owner can afford to carry bilge water, he can also afford to carry its antidote. But if he does not carry bilge water, what is the use of the cement? To try the truth of this reasoning, the vessels forming the subject of this paper have their bottoms inside the ballast tanks merely cement washed. The effect is a saving in dead weight of approximately 120 tons. To allow free drainage in the bottom, it is built clincher fashion, and for the same purpose the keel plate between the internal butt straps is cemented. Again, for the purpose of insuring the tanks being pumped dry, the cement has been left off the keel plate at each center suction, thus enabling the large trumpet-mouthed strums to be placed within three-fourths of an inch from the keel plate, which is an outside strake. To carry off the vapors common to all ballast tanks, they have been fitted with 6-inch ventilators. The upcast pipes ventilating the tanks under the engines and boilers are led to the forced draught fan. Each vessel has been carefully inspected at the termination of every voyage, and, after the most minute examination of the inside of the outer bottom, no pitting or corrosion could be discovered, and the cement wash was found to be preserving the steel on the bottom as well as any other part of the tank.

It may be of interest to add that these vessels' capacity for water ballast is about 3,000 tons, which, without bunker coals, immerses them to a draught of 18 feet aft and 14 feet forward. At this draught the propeller is completely immersed. This is owing, first, to the possibility of fitting, in a vessel with an overhung rudder, the center line of the shafting nearer to the base line, and, secondly, to the fact that a smaller diameter of propeller has been adopted than is usually customary. The advantages resulting from an adequate ballast draught and the complete immersion of the propeller in a seaway have been so effectually brought home to ship owners and underwriters by recent events that we will not dilate upon them. The economy is apparent, not only in speed, but likewise in the immunity from shock and consequent disaster to every part of the machinery, from propeller to stop valve.

The diameters of propellers in the merchant service are usually designed to meet the load draught requirements, but there are many cases where a better balance can be secured between load and light draught performances by adopting propellers of less diameter than those now generally in use. In any vessel where the propeller is not completely immersed at ballast draught, it would be advisable to take the diameter of the propeller as a factor in determining the size of the shafting.

ALONG ATLANTIC AND PACIFIC COASTS.

WHAT THE BUILDERS OF SHIPS ARE DOING BOTH EAST AND WEST—EVERYWHERE THEY ARE BUSY.

The steamer H. B. Plant, the nineteenth steamer which the Merril-Stevens Engineering Co., Jacksonville, Fla., have built, has far exceeded the requirements of her contract. Her speed has proven in excess of 14 miles an hour and her indicated horse power over 400, and this on a draught of 36 inches and a displacement of less than 150 tons. Following is a brief description of the vessel: Hull of steel, length over all, 127 feet; beam, molded, 21 feet 6 inches; depth, 7 feet 6 inches; draught, light running trim, 2 feet 10 inches; speed, 14 miles an hour; passengers allowed, 400; tons freight capacity 100, on 4 feet depth. Machinery consists of one inclined condensing engine with Corliss valve gear; diameter of cylinder, 24 inches; stroke, 60 inches; one two-furnaced Scotch boiler; diameter of boiler, 8 feet 4 inches, length 13 feet; steam pressure allowed, 105 pounds. The Merril-Stevens company has two ship yards besides their own shops and own and operate two marine railways with a capacity to haul out 1,200 and 800 tons respectively. They employ from 150 to 250 men. Their 80-foot steel derrick shears will hoist 50 tons.

The first of the three great merchant ships built for the Oceanic Steamship Co., to trade across the Pacific, was launched at the works of the Cramps, Philadelphia, last week, and was christened Sierra by Miss Carrie L. Hayward. The launch of the great ship was accomplished without a hitch. The principal dimensions of the Sierra are: Length between perpendiculars, 400 feet; extreme breadth, 50 feet; depth, 43.6 feet; displacement, 7,000 tons; speed, 17 knots. It is expected that the Sierra will be completed in time for delivery in San Francisco before Sept. 1. The Sierra will ply between San Francisco, Hawaii and Australia.

M. A. Sweeney & Bro., at Jeffersonville, Ind., have launched for the government a steel snag boat to be known as the Arkansas. She is 140 feet long, 30 feet beam and 4 feet depth of hold. She has two engines, each with 10-inch cylinders by 4½ feet stroke, and two boilers, each 40 inches by 20 feet. The firm is also building a dredge to be used by the government at Montgomery, Ala. The dredge is 120 feet long, 30 feet beam and 5½ feet depth of hold. Engines will be 16 by 16 inches. The entire vessel is being built by the Jeffersonville firm, including the dredging apparatus.

The American liner New York broke the shaft of her port engine May 25 when in latitude 47.20, longitude 30.16. The shaft broke near the sleeve, carrying away the propeller and outside bracket. After a stop to ascertain the extent of the damage the New York proceeded under her starboard engine, making fifteen knots an hour. She was later taken to the works of the Newport News Ship Building & Dry Dock Co., Newport News, Va., for repairs.

The Marine Engine Co. of New York city has been formed for the purpose of manufacturing and dealing in engines for marine purposes. The capital stock is $5,000,000. The incorporators are: F. W. Spear, L. A. Ludwig, G. E. Bailey, R. H. Monsees, E. S. Price, all of New York city; W. E. Puall, attorney, Hoboken, N. J.

H. M. Bean's ship yard, Camden, Me., is a busy place at present with the five and six-masters (wooden vessels) on the ways for Capt. J. G. Crowley of Taunton, Mass. One hundred and twenty-five men are now employed on these vessels and rapid strides are being made toward the completion of the six-master.

McKay & Dix of Bucksport, Me., are building some good sized schooners in Verona. They lately received six pine masts for the ships. the largest of the six is 108 feet long and 27 inches in diameter.

The Harlan & Hollingsworth Co., Wilmington, Del., launched the new Metropolitan steamship James S. Whitney on May 29. The ship is 288 feet long, 43 feet wide and 19 feet deep.

The keel of a wooden schooner to be built by George L. Welt of Waldoboro, Me., has been laid. Its extreme length is 257 feet. The Welt yard covers fifteen acres.

ALONG THE PACIFIC COAST.

The steam schooner J. S. Kimball, built for the Kimball Steamship Co., was recently launched at Everett, Cal. She is intended for the Cape Nome trade. She will be loaded with 300,000 feet of dressed lumber and towed to San Francisco where a part of the lumber will be employed in completing her.

Four ship yards are now in full blast at Aberdeen, Wash. Wilson Bros. yard has two ships building. The West & Slade yard has just laid the keel of a large vessel. Lindstrom's yard has two vessels nearly completed; one will be launched in less than three weeks. Peter Wilson & Bro. are building a fine passenger and freight steamer at the old Weatherwax ship yard.

The Russian cruiser Variag, built at the works of the Cramps, Philadelphia, made 21 knots an hour under natural draft in a run from the Delaware breakwater to Shinnecock light, last week. Mr. Edwin S. Cramp accompanied the inspecting party. Mr. Cramp reports the new Niclausse boilers working most satisfactorily. Several firing tests of the guns were very satisfactory to the Russian officers.

BACK NUMBERS OF THE REVIEW.—Liberal subscription extensions will be made by the Marine Review for issues of Jan. 21, 28 or Feb. 4, 1897, or July 21, 1898.

MARINE REVIEW

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The simple little item of ocean surveys in the naval appropriation bill has prolonged the session of congress at least one day. The house of representatives cut down the appropriation for ocean surveys in the naval bill to $10,000 which meant that they were not to be made by the navy department at all. The senate restored the appropriation to $100,000, the original sum asked for by the hydrographic office of the navy. When the subject came up in conference a compromise was effected, appropriating $50,000 for the hydrographic service. Mr. Foss, the chairman of the house conference committee, explained that the senate had absolutely insisted upon the provision for ocean surveys. Mr. Cannon, who has led the fight against ocean surveys by the navy department, indignantly declared that the house conferees had violated the instructions of the house in the conference agreement. He asked the house to reject the conference report and to dismiss the committee. The fight which was precipitated thereby caused congress to stand over for a day. Cannon carried his point and a new committee was appointed to confer with the senate committee—a committee, by the way, wholly hostile to ocean surveys.

All of which is very unfortunate and is due to ill feeling on both sides. Cannon was enraged at the political influence which the navy department endeavored to exercise to retain the ocean survey appropriation in the naval bill. When the appropriation was reduced by the house, the bureau of equipment, through Commander Todd, chief of the hydrographic service, issued a circular letter to chambers of commerce and maritime boards, urging them to petition congress by letter and by telegram to restore the original appropriation. This introduction of outside interference was certainly unwarranted and was calculated to provoke anger. What the bureau of equipment should have done was to have presented its own argument against the reduction of the appropriation. Surely there are a thousand arguments which it could have advanced through its own bureau. When Cannon brought the matter to the attention of Secretary Long, the secretary denied that any such action had been taken by the navy department. The fact was that Secretary Long had not been informed. When he discovered that he had been deceived by his own department he promptly suspended Commander Todd.

We repeat that the situation is unfortunate. The ocean surveys should be made by the navy department. There are no charts in the world like the hydrographic charts. For sixty years the hydrographic office of the navy department has been making the ocean surveys, and then chronicle everything that the mariner wants to know. Moreover, charts should be made by those who have to follow them in navigating the waters. It will be a great pity indeed if this feature of the work is taken from the navy department. The situation would never have arisen had a little more diplomacy been exercised. The navy department erred in attempting to dictate to congress, which is in charge of the people's money, and should be left untrammeled. Cannon, too, is inclined to be unreasonable. His fury has somewhat blinded his better nature. It should be excused as a bit of bad judgment. It is to be hoped that the day will bring a reasonable appropriation to the hydrographic service for ocean surveys. It is to be hoped also that the suspension of Commander Todd, who is an excellent officer, may not be for long.

Senator M. A. Hanna of Ohio rarely speaks in the United States senate. But when he does he says something. He is not an orator, as Brutus is, but a plain blunt man who speaks his mind. He took the floor in the senate on the armor controversy the other day and when he had done some of the members knew more about the subject of armor plate than they have ever known before. Hanna is in direct contrast to Tillman and Pettigrew. He has none of their exaggerations and none of their injustice of statement. It is clear that he has contempt for the man who merely asserts a thing. What Hanna wants is proof. He told the senate that the manufacture of armor plate was a question of raw material, of labor and of proper machinery. He showed the members that it would be impossible for the United States to begin the manufacture of armor plate under three years. No steel manufacturer could turn out an armor plate forging press under three years. The government could not then engage in the manufacture of armor plate without employing experts. It could not obtain these experts without engaging them at higher salaries from existing companies which would in itself defeat the end sought—that of economy. He contended also that it is susceptible of proof that the present price of armor is a reasonable one. The United States government is paying less per ton than either England or Russia. It is patent upon its face that it is procuring armor at a less figure than it can manufacture it.

Whatever may be said of Hanna he has a barrel of brain. It is lucid and capacious and it has been trained to see clearly. Extraneous matter does not confuse him. He never loses sight of the main issue. He goes directly to the pith of the matter. His essential characteristic is honesty and he has a firm grip on principles. His conclusions are therefore nearly always correct. There is much misconception regarding him. Indeed it may be said to be general. Many believe him to be coarse and cruel, some believe him to have bristles and a few believe him to have horns. This impression is the legacy of the cartoonist. The real Hanna is vastly different. The real Hanna is calm, well fed and patient, with a polish which comes through constant association with men of distinction. His brusqueness has given way to a gloved firmness. The metamorphosis of the bluff business man into the suave diplomat has been complete. The energy is still there but it is steady and even now, instead of explosive.

Hanna is right on the armor plate question. Its manufacture by the government is nonsense.

NAVAL WAR COLLEGE.

OPENING OF THE REGULAR SUMMER SESSION AT NEWPORT—ADDRESS BY HON. FRANK W. HACKETT, ASSISTANT SECRETARY OF THE NAVY.

The regular summer session of the naval war college was formally opened last week at Newport, R. I., the Hon. Frank W. Hackett, the assistant secretary of the navy, addressing the class. There was the largest gathering that has ever attended an opening session. Not only were the members of the class present, but all the officers who could attend from the various war ships in the harbor were on hand.

The opening remarks were made by Capt. C. H. Stockton, the president of the college. He said that the course this year would be noted for two features, one that officers from every branch of the United States service would be in attendance, and the other was that the opening address would be made by a man who had seen service in the navy during the war and later had served on the Geneva arbitration board, which brought the United States and England so closely together. He then introduced the assistant secretary, who was received with great applause. Mr. Hackett said:

"Our navy has never been intrenched more firmly in the popular heart than at this very hour. Coast and interior alike pulsate with a thrill of patriotic fervor for glorious achievement. The peaks of the Rockies, as it were, catch the spray of inspiration. The average American citizen, though he may be a little mystified at its technique, is proud of the navy. Now that the sphere of our responsibility as a nation has widened, and populations heretofore strange to us rely upon the American flag for an advance of civilization, and for the blessings of a stable government with political freedom, it is plain that new duties are required, and will continue to be required of our commanding officers in distant waters. It behooves us, then, to ponder well the inquiry, How shall the navy officer of the near future best meet the demands that his country has laid upon him? Such is the question you study here to answer.

"It is curious to note that two branches of the service which have so much in common should differ widely when brought to a definition. Speak of the army, and you call before you a body of men armed and trained. Speak of the navy and we picture to ourselves ships armed and furnished with officers and crews. That is to say, while the former means men, the latter brings up the material instrument with which men work—a ship and her guns, rather than the man himself. But the world has personified a ship, from the days of Homer down. The custom ought not to blind one to the truth that the ship and her armament is, after all, but so much inert matter. It is the man—the brain of man—that is everything. That we may have peace you teach war. You hold officers to the one central fact that the navy means organized preparation to crush an enemy. It means that men and material are ready upon the instant. When Napoleon was asked why his first Italian campaign was the most successful of all his campaigns, his reply was: 'Because it was most carefully studied out beforehand.' All the book learning in the world might fail to create a successful captain; and yet the leader who can profit by the experience of others has the advantage of him who relies altogether upon his own intuitions. So here you proclaim that study and hard thinking are in order. A battle on land or water means that somebody has been working out a plan. These various plans in time have evolved rules and maxims, based on certain principles that prove of more or less value as guides for future action. What these rules are, how best to apply them, when they can be safely violated—these, and such as these, are vital topics with which the war college deals. All that is intellectual in the makeup of the officer responds gladly to the prospect of an exercise thus invigorating and broadening.

"In war, as in every other struggle, the test of success is that the commander works out the largest results possible with the instrument put into his hands. He that waits that he may have something better to go ahead with never wins a battle. The effective force to be got out of a ship depends on the man who handles her. These, to be sure, are but commonplace observations; but, nevertheless, the idea they embody ought ever to be present to the mind of an officer fit to command. Obviously, the naval profession lies open to very much the same influences that operate in other professions. There can be no lowering of the standard. Matchless as is the record of past achievement, the captain of the future must subject himself to a test even more rigid. He shall evince more ardor than Paul Jones; more skill than Hull; more daring than Decatur; more firmness than Farragut. First and always he shall be a sailor—shall excel in seamanship. Sails and topgallant masts have disappeared, but the mystery of the ocean remains. To read wind and current; to have his ship in hand through storm and calm; to keep her staunch and trim, and at her best—this is to be in truth a sailor.

"Your officer is to carry a stout heart—shrink from nothing—take the risk. He must harbor a comprehension of that miracle of human ingenuity beneath his feet, the modern battleship. He must be able to boast some acquaintance with chemistry, electricity, hygiene, some familiarity with diplomacy and with the outlines of international law. We would have him conversant with human nature under a blue flannel shirt. Let us avoid imposing upon a ranking officer a burden of multitudinous details. His talent and energy are pledged to a service infinitely more important. His business is to study deep, and again and again to reflect upon the problem how to perfect himself in the use of that which his country has intrusted to him, wherewith to meet and destroy the enemy. This it is to compass the art of war in a larger aspect, to rise above what is petty, and to deal with what is grand and enduring."

A reception was then held in the library in honor of the assistant secretary and in the afternoon Mr. Hackett was taken for a spin on the torpedo boat Porter and shown the workings of such craft, several torpedoes being fired for him. Later he visited Fort Adams, where he was received with the customary salute, and a battery drill was given in his honor.

Signor Marconi, the wireless telegraphy expert, reached this country last Saturday on the American line steamer St. Paul. Mr. Marconi says he is here on private business. He had a little baggage other than a wireless telegraph outfit. Some of his assistants experimented with wireless telegraphy during the South African war and were successful in sending messages for over 100 miles from ship to ship.

FINE BIT OF DRY DOCK ENGINEERING.

A neat and rapid bit of engineering in connection with a dry dock job was that accomplished at the works of the Harlan & Hollingsworth Co., Wilmington, Del., a few days ago, when the steamer Indian was cut in two and the sections of hull pulled apart 40 feet for the purpose of lengthening the vessel. First the steamer was docked perfectly plumb with ground ways set in exact line with the keel, allowing sufficient height for settling when the additional weight would be put on, and packing was fitted to the hull in a manner as nearly perfect as human ingenuity could make it. The packing was then removed, tallow placed between the bilge and the ground ways, and the packing replaced. Before the actual work of pulling apart was begun, straight edges were placed on the main deck, with lines on the hurricane deck fore-and-aft, and a plumb bob suspended from the upper deck to the center keelson, a distance of 30 feet. Two nests of piles, four in each, were driven at the head of the dock for purchase. Chains were led out of the hawse pipes, with chain toggles in each of the forward lower ports, using two six-fold purchases on each side, each one leading to a crab. For additional purchase two luff tackles were applied, leading to the hoisting engine, but these were not, however, used. The strain was put on the ship at 9:35 a. m. She immediately began to move and at 10.50 (just 1 hour and 15 minutes) the portion of the ship weighing 350 tons and having a height of 40 feet from the keel to the top was moved 40 feet, without a fraction of an inch deviation.

SHIPPING BILL GOES OVER.

Senator Frye, who has had charge of the shipping bill, now admits that there is no chance of securing its passage at this session. Discussing the subject recently, he said:

"I am very sorry that this is the case, but I look for the early passage of the bill at the next session. The anxiety shown by foreign ship owners to defeat the bill is of itself proof of the wisdom of the measure. They dread the competition of a large fleet of new American ships. It is absurd for this great nation to be dependent for ships on European countries that may at any time become involved in war. The shipping bill in providing for a large increase in tonnage, thus automatically provides for a reduction in ocean freights. In that way the American people will in time receive in reduced freights several times as much as they pay out in aiding in the establishment of our shipping in the foreign trade. The measure is greatly needed and ought to be passed at once."

ENORMOUS DOCK PROJECT.

Among important improvements undertaken of late by the Pennsylvania Railroad is the establishment of an enormous new freight terminal and docks on New York bay. This was provided for some years ago, when the company acquired over half a mile of water front at Greenville, New Jersey, to the southward of Jersey City. A branch line or cut-off is to be built from a point west of Newark, crossing Newark bay, and bringing the heavy freight traffic of the company, more particularly coal, to the new terminus. The bulkhead line is now 3,500 feet from the shore, but an application made to the authorities at Washington to establish a new bulkhead line about a mile from the present banks has this week been granted, thus affording opportunity by filling in for the creation of a railroad yard of the largest proportions. From the bulkhead ten piers, each nearly a mile long, are to extend into the harbor. The plan contemplates the creation of some 15,000,000 square feet of land where there is now only shoal water, and the whole project is on so large a scale that a number of years may elapse before substantial progress is made. Enormous warehouses and large plants for the transshipment of coal from cars to vessels are also contemplated, the idea being to provide for both the freight traffic which now goes to the Jersey City terminals of the Pennsylvania and for the further steady and constant growth which this business exhibits. The work that will be undertaken in this connection is the largest of its kind ever planned in New York harbor, and illustrates the far-reaching projects which the Pennsylvania Company has now on hand for the improvement of its property.

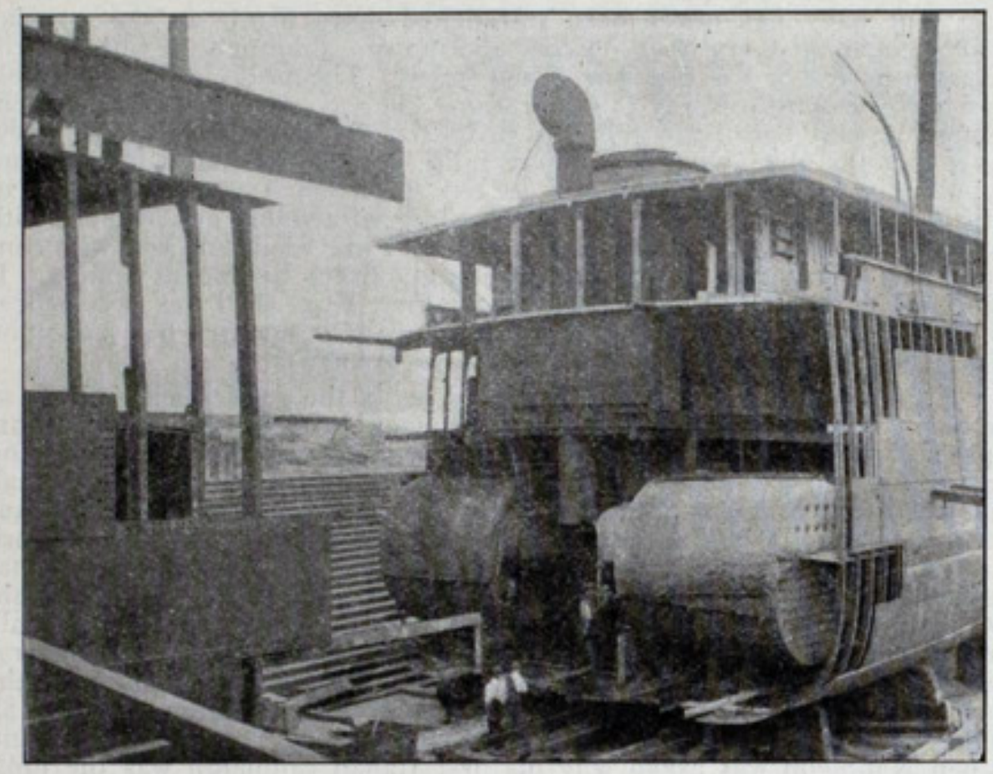
AMERICA HAS NOTHING TO FEAR.

Mr. H. G. Morse, president of the New York Ship Building Co. of Camden, N. J., recently returned from a trip to the United Kingdom.

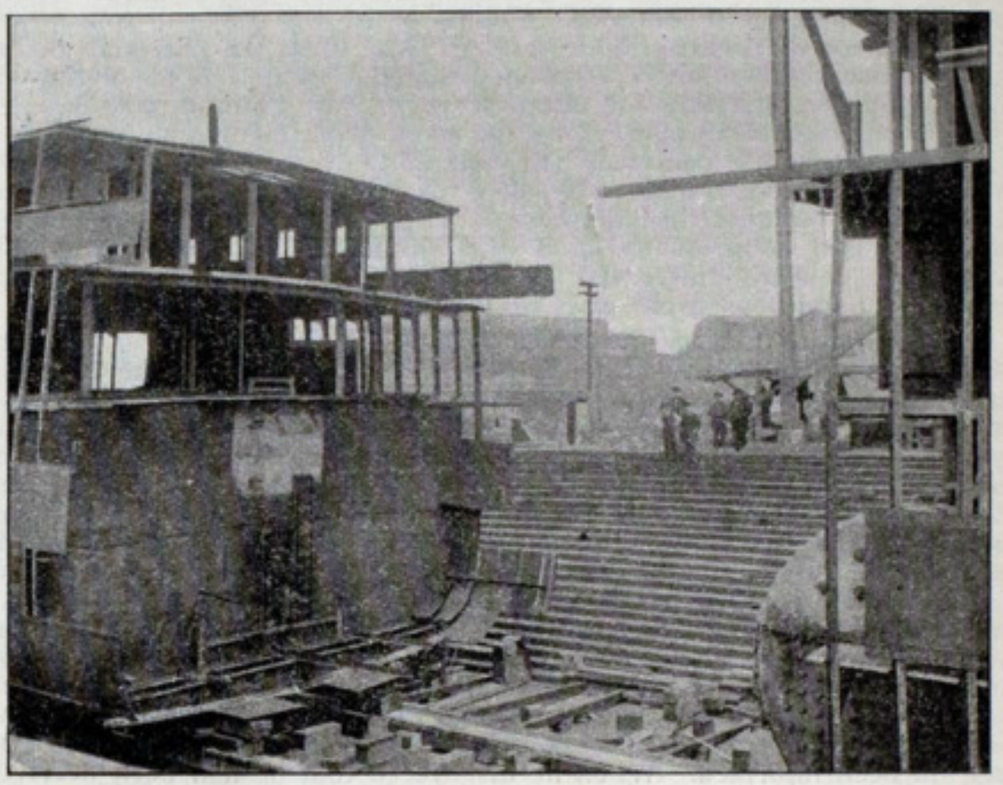
"Americans have nothing to fear from other nations in the ship building line," said he. "Due credit must be given such great yards as those on the Clyde and at Belfast, Barrow-in-Furness and New Castle, where many improvements have been made, but the United States can more than hold its own, even in the infancy of its work."

The battleship Texas has been ordered transferred to the New York navy yard for repairs. Norfolk has made an indignant protest against the transfer.

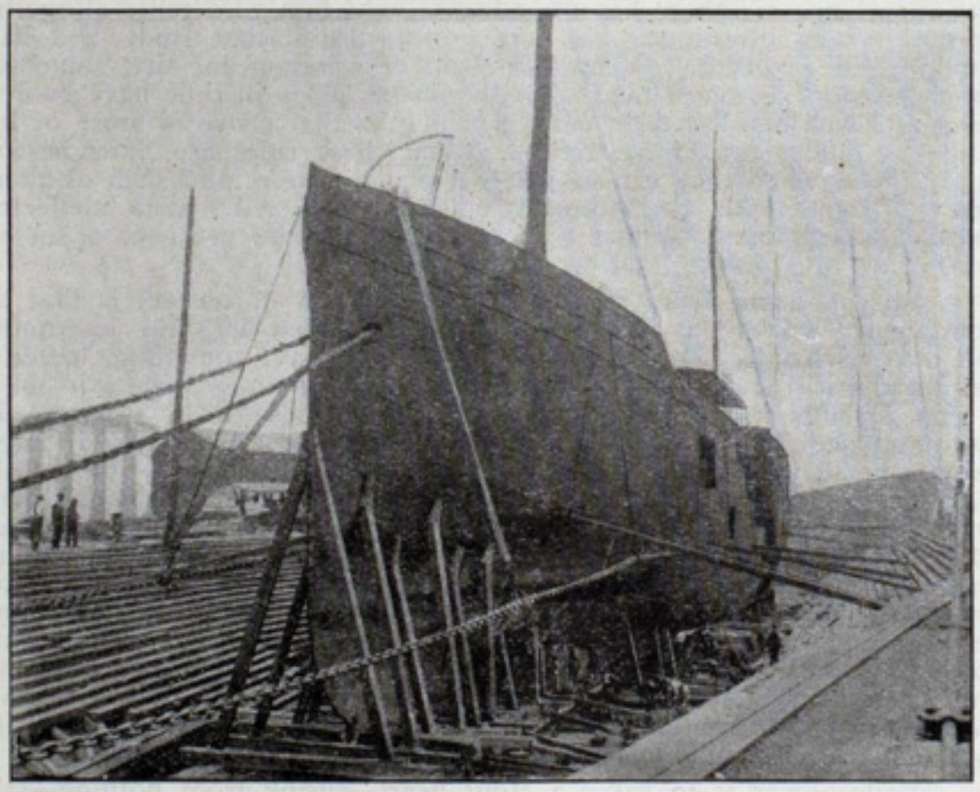
Preparations for Lengthening Steamer Indian at Works of Harlan & Hollingsworth Co., Wilmington, Del.



BOW SECTION OF THE SHIP AFTER SEPARATION



STERN SECTION OF THE SHIP AFTER SEPARATION.



BOW SECTION AS PREPARED FOR THE PULL.

SIDE VIEW OF THE SEPARATED VESSEL.

DEVELOPMENT OF GERMAN MERCANTILE MARINE.

The development of the German merchant marine has been phenomenal during the past few years. A glance will show the strides that have been made. The first to come to notice is the North German Lloyd of Bremen, which increased its capital stock from £2,000,000 to £3,000,000 in 1898 and to £4,000,000 in 1899, and upon the latter sum a dividend of 7½ per cent. has been declared for the past year as compared with 7 per cent. on less capital in 1898. The additions to the fleet during the year comprised seven vessels, whilst five others under old contracts were still in the hands of the builders. The new vessels ordered were one in substitution for that returned to the constructors, a double screw steamer Kaiser Wilhelm II, from the Vulcan works of Stettin; one of the Rhein class from the firm of Tecklenborg, of Geestemunde; one of the Koln type from the Vulcan Works of Bremen; and two of Furness, Withy & Co., of West Hartlepool, for the East Asian freight service, one of which has already been delivered. In addition to these, orders were given for ten steamers which are expected to be completed this year for the coasting trade in Indo-China, and for eight steam tugs, whilst three vessels chartered by the company were purchased outright.

The extension of the mail steamer service in the east will in future bring within this company's sphere of activity all the important ports in farther India and the China seas, whilst with the co-operation of Melchers & Co., a regular service of steamers has been established on the Yang-tse-Kiang river, between Shanghai, Hankow and Ichang. Towards the end of the year the company acquired from the Scottish Oriental Steamship Co. its fleet of fourteen steamers engaged in the trade between Hongkong, Swatow and Bangkok, Siam, and the vessels formerly belonging to the Holt East India Ocean Steamship Co., which were purchased by a German syndicate in the spring of 1898. It is the intention of the Lloyd to extend these lines, and within a year it is anticipated that no less than forty steamers will be engaged in the coasting trade in that part of the far east. During the course of the present year the monthly sailings in connection with the Australian mail service will be converted into departures every three weeks, and the company has proposed to the government to include the recently-acquired Caroline and Marianne islands within the scope of its operations.

The 100th Torpedo Boat launched at the Yards of F. Schichau, Germany.

The Hamburg-Amerikanische Packetfahrt Gesellschaft shows an even more rapid increase of ordinary share capital than the North German Lloyd. The capital stock has been increased from £1,500,000 in 1895 to £4,000,000 in 1899. It was found that the ships of the company were unequal to the task of carrying all the business of the company and so £110,000 was expended in chartering foreign steamers to assist in the carrying trade. About 179,000 tons of additional tonnage will be added to the fleet. It is proposed to establish a new and regular line between Hamburg and the various ports of North Brazil, including Para, Manaos and Ceara, so as to obtain possession if possible of the considerable amount of carrying trade between these ports and Germany, now exclusively held by English shipping countries. The casual service rendered by the company in the trade between Italy and North America is to be transformed into a regular line of steamers and a new field of activity has been opened in the shape of a ten years' contract for the transport of large quantities of ore for German iron works, which will insure an annual income of £300,000 independently of any fluctuations in the freight market during that period.

The Lloyd and the Packet company have established a common freight service of steamers to the far east under a subsidy of the government, the first vessel of the latter company, the Hamburg, having been completed a few weeks ago. It will be understood from this that the Lloyd inaugurated the service some time ago, and it has since been found that the line was well developed, especially in view of the continued opening up of China. The joint enterprise has contracted with the Shantung Railway Syndicate for the transport of all the plant and material required in the construction of the railway, and it is expected that the agreement to this effect will lead to the introduction of further steamers in the service, with the inclusion of Calcutta and Bombay among the ports of call. Another line which the Packet company established in 1898 in conjunction with other shipping companies—the New York-East Asian service—has resulted satisfactorily, and seems to have assumed a normal stage of development. The West Indian-Mexican lines continue to suffer from the uncertainty of the political conditions in the Central American States, whilst the line between Genoa and the Argentine Republic, which had yielded favorable results, has been sold to an independent Italian company, the Italia, having a capital of £200,000. By means of an arrangement made with the Schichau Works, of Elbing, it has been possible to obtain until the end of 1900 the use of the Kaiser Friedrich, to which reference has already been made in the case of the Lloyd, and the company will thus have at its disposal, especially in view of the pressure of cabin passengers during the Paris exhibition, five double-screw high-speed steamers and eight ordinary double-screw vessels. In catering for this traffic it is noteworthy that a lease has been obtained of two Paris hotels where first-class cabin passengers are afforded accommodation at cost price to the company. Besides the re-purchase of the Columbia, the fleet received an accession of eight new steamers last year, two others have been placed in service since Jan. 1, and the Deutschland is expected to be completed by the end of the present month; whilst five old steamers have been disposed of at favorable prices. At New York the company has transferred its ground property at Hoboken to the Hamburg-American Line Terminal & Navigation Co., whilst extensive administrative buildings are proposed to be erected in Hamburg on several sites acquired in Ferdinand Strasse. It is noteworthy, too, that in consequence of the high price of coal the company proposes to provide some of the steamers for the East Asian line with furnace equipment for the use of liquid fuel in the shape of Borneo oil.

The Deutsche Ost Afrika Line of Hamburg has come very prominently forward in connection with the trade between Germany and East Africa. It has entered into an agreement with the government not only for an improved service to East Africa via the Suez canal, but also for the establishment of a new line via the west coast and the Cape, so as to encircle completely that immense continent.

The Deutsche Levante Line of Hamburg now has a fleet of twenty steamers, five of which were added during the past year by increasing the capital stock from £90,000 to £200,000. This accession has enabled the company to establish a new monthly line between Hamburg and Antwerp to the Syrian coast and to carry the parcels post to the Levant.

The Deutsche Dampfschiffahrts Gesellschaft Hansa of Bremen has been able to maintain for 1899 the improvement exhibited in the previous year, there being paid in each case a dividend of 14 per cent. upon a capital of £500,000, which is now being increased to £750,000. It appears that owing to lack of vessels the trade on the regular line to India largely suffered, so that the departures for Bombay had to be restricted. The service to the Argentine Republic showed good results in consequence of the satisfactory return freights which continued throughout the year. Five steamers were sold and two new vessels ordered, these being delivered in June. The development of traffic with India necessitates a speedy increase in the tonnage, and for this purpose an issue of £250,000 fresh capital is being made and a scheme is under consideration for adding five further steamers to the general fleet.

The Deutsch-Australische Dampfschiffs Gesellschaft of Hamburg, on the completion of the new steamers in course of construction, will have a fleet of twenty vessels engaged in the Australian trade. According to the company's report for 1899, the profits were largely in excess of those realized in 1898, but the dividend of 10 per cent. is the same as in the previous year, although it is paid on the higher capital of £300,000, as against £250,000. The report states that the freight war which commenced at the beginning of 1899, between the German and English sailing and steamship companies, was terminated after a few weeks by an understanding being arrived at between the various parties concerned. It is proposed to establish an independent line of vessels for the trade to Brisbane and other Queensland ports, with departures at intervals of one month. The present year has opened with improved conditions in regard to freights, but the company is suffering considerably through the war in South Africa.

The Deutsche Dampfschiffahrts Gesellschaft Kosmos of Hamburg has been able to increase the dividend of 9 per cent., paid in 1898, to 11 per cent. for 1899. Of the forty-nine journeys completed by the fleet last year, the report points out that thirty-one were departures for Chili, Peru and Ecuador, and eighteen to Central America. In order to promote trade between Central America and San Francisco the sailings were extended, so that since last September a monthly service has been performed, and three new steamers of 6,500 tons were ordered to meet the requirements of the case. The advance in the price of coal considerably enhanced the working expenses, but the company availed itself of the opportunity to counteract the effects of dear fuel by gradually increasing the freight rates on the return journey for the transport of saltpetre, copper, and other materials.

The Chinesische Kustenfahrt Gesellschaft of Hamburg has been engaged in the coasting trade of China for several years, and since 1888 an average dividend of 3 per cent. per annum has been paid. The dividend just declared for 1899 amounts to 4 per cent., the prospects of the company having considerably improved last year, and also so far as the present year has gone.

SPECIAL CATALOGUE FOR PARIS EXPOSITION.

A special catalogue for distribution at the Paris exposition has just been issued by the Chicago Pneumatic Tool Co. Under each tool or machine in the catalogue is a brief but comprehensive description in English, French and German. The paper used is what is known as 25 by 38-inch, 120-pound, diamond D superfine double enamel, which embraces the highest degrees of perfection for printing purposes. The covers are of wine-colored Princess cover paper, printed with gold bronze and embossed both obverse and reverse. The half-tone illustrations were made from original photographs and wash drawings, which were prepared with a view to attaining the best possible results in the illustrations. In looking through the catalogue, we find that it not only shows the tools (pneumatic) themselves, but represents them in practical operation in all branches of industry—foundry work, boiler work, marine repairs (both in and out of water), bridge construction, ship building, marble and granite work, tank work, mining, painting, air hoists, railway speed recorders, locomotive bell ringers, etc. Press work, also of the best quality, brings out with remarkable clearness the most minute details of machinery, and the catalogue as a whole will undoubtedly be one of the most attractive at the exposition.

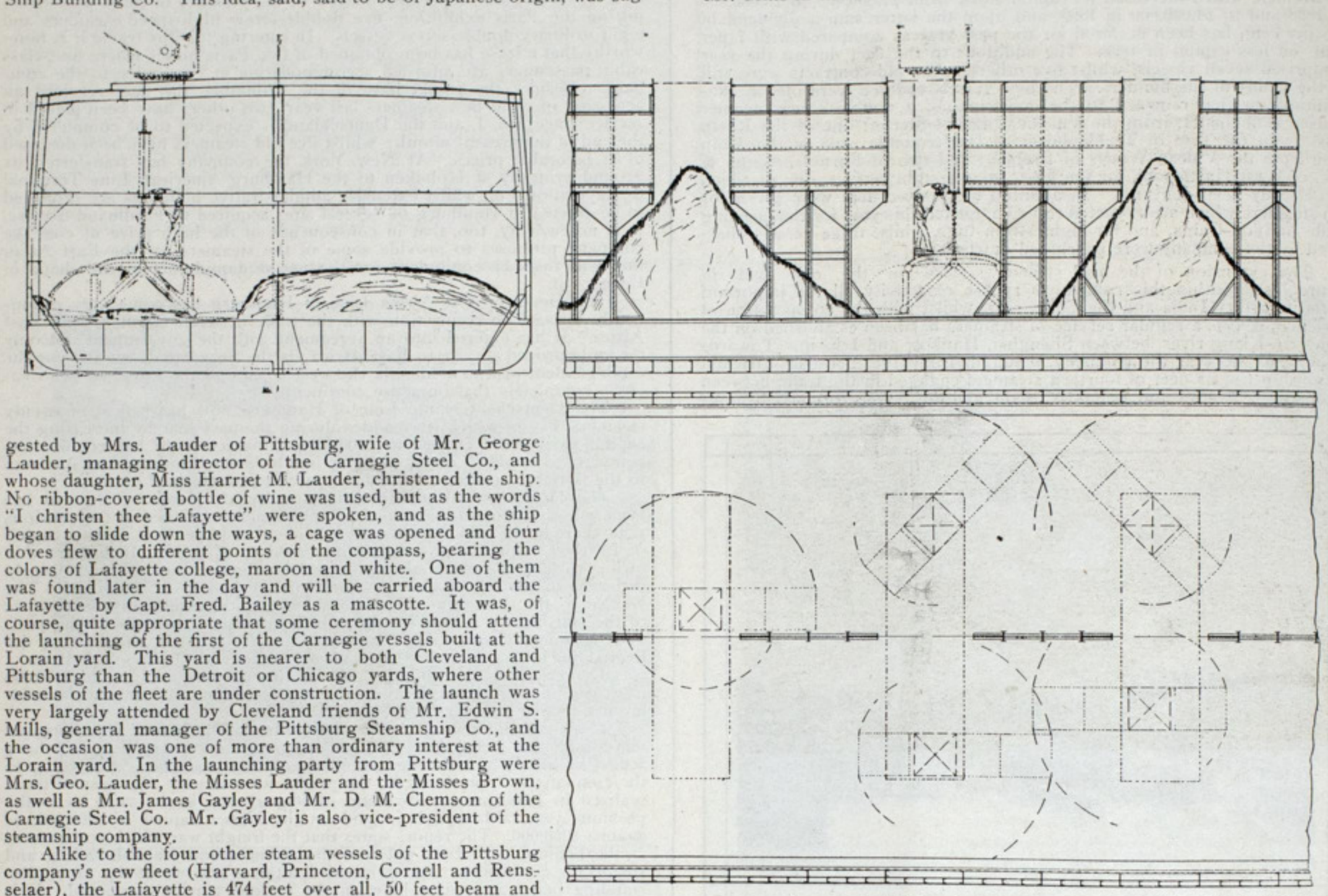
It is expected that within two weeks one of the buildings of the plant of the Eastern Ship Building Co. at New London, Conn., will be completed.

LAUNCH OF THE CARNEGIE STEAMER LAFAYETTE.

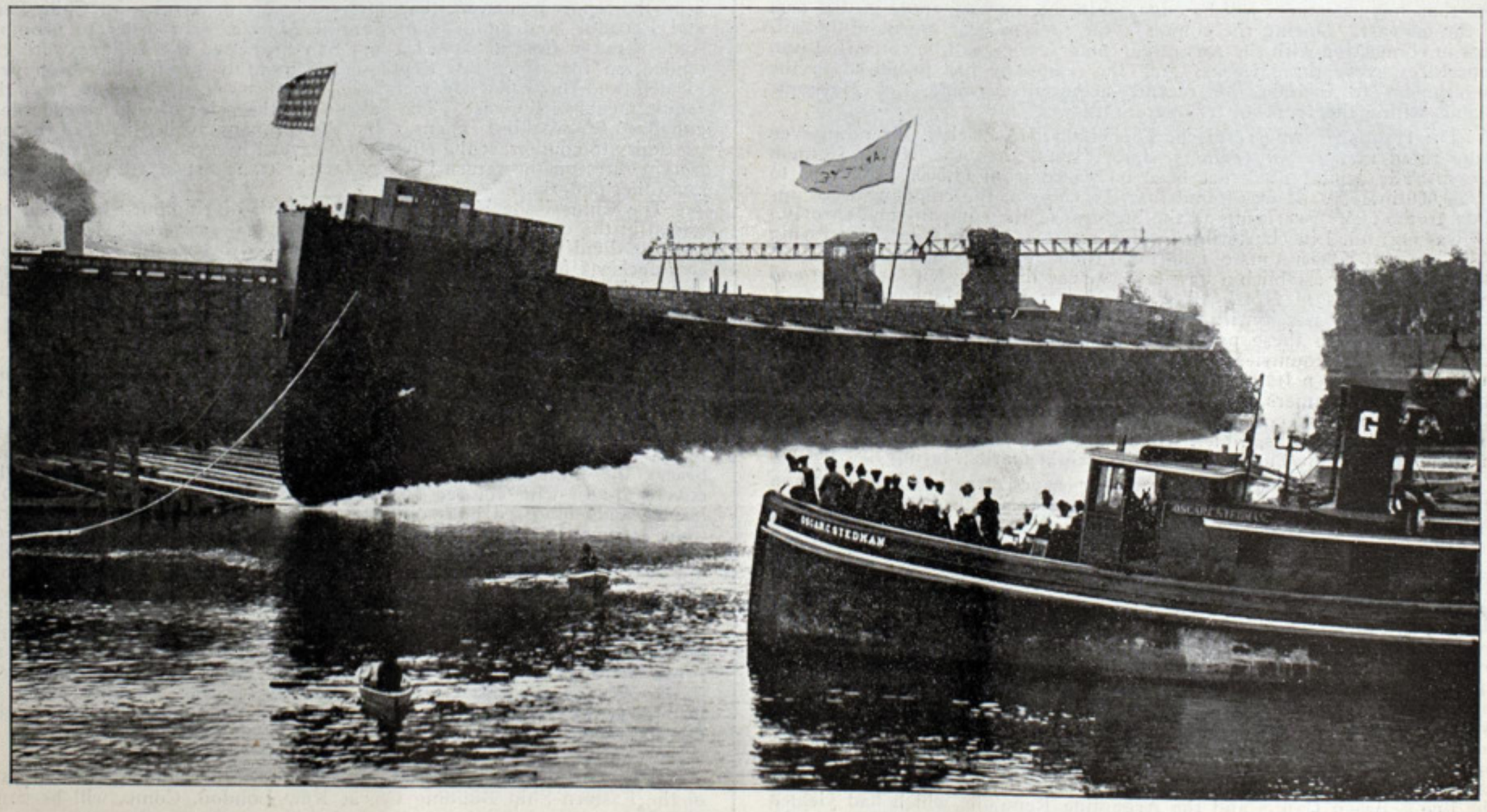
The pleasing custom of releasing a few doves upon the launch of a ship was carried out very successfully on Thursday last when the Carnegie steamer Lafayette was launched at the Lorain works of the American Ship Building Co. This idea, said, said to be of Japanese origin, was suggested by Mrs. Lauder of Pittsburg, wife of Mr. George Lauder, managing director of the Carnegie Steel Co., and whose daughter, Miss Harriet M. Lauder, christened the ship. No ribbon-covered bottle of wine was used, but as the words "I christen thee Lafayette" were spoken, and as the ship began to slide down the ways, a cage was opened and four doves flew to different points of the compass, bearing the colors of Lafayette college, maroon and white. One of them was found later in the day and will be carried aboard the Lafayette by Capt. Fred. Bailey as a mascotte. It was, of course, quite appropriate that some ceremony should attend the launching of the first of the Carnegie vessels built at the Lorain yard. This yard is nearer to both Cleveland and Pittsburg than the Detroit or Chicago yards, where other vessels of the fleet are under construction. The launch was very largely attended by Cleveland friends of Mr. Edwin S. Mills, general manager of the Pittsburg Steamship Co., and the occasion was one of more than ordinary interest at the Lorain yard. In the launching party from Pittsburg were Mrs. Geo. Lauder, the Misses Lauder and the Misses Brown, as well as Mr. James Gayley and Mr. D. M. Clemson of the Carnegie Steel Co. Mr. Gayley is also vice-president of the steamship company.

Alike to the four other steam vessels of the Pittsburg company's new fleet (Harvard, Princeton, Cornell and Rensselaer), the Lafayette is 474 feet over all, 50 feet beam and 28½ feet moulded depth. She will carry about 7,200 gross tons of ore on 18 feet draught. Her engines are of quadruple expansion type, having cylinders of 18, 26¾, 41 and 63 inches diameter, with a common piston stroke of 42 inches. Boilers are of Babcock & Wilcox watertube type. The horse power of this machinery is about 1,950.

Aside from the essential particulars just noted, it may be said that the Carnegie vessels are similar to the large fleet of modern ore carriers turned out of lake ship yards within the past two or three years. In anticipation, however, of the use of machines that are being developed at Conneaut for the unloading of ore, certain changes have been made by Mr. Mills in the hold construction of these ships. The changes have the approval, of course, of the builders, as well as a large number of naval architects who were consulted before work on the vessels had been very far advanced. The object is to facilitate the use of the scoop portion of the unloading machine now under trial at Conneaut. The change of construction in the way of hatches throughout the cargo hold is shown in a



HOLD ARRANGEMENT OF CARNEGIE SHIPS—TO FACILITATE USE OF UNLOADING MACHINE.



LAUNCH OF THE CARNEGIE STEAMER LAFAYETTE AT LORAIN, O.

drawing printed herewith. In lieu of fitting stanchions as originally designed 8 feet apart throughout, it was decided to fit them 4 feet apart between hatches, and on the hatch beams to carry an additional channel

STERN VIEW OF CARNEGIE STEAMER LAFAYETTE

stanchion for the height of 'tween decks, securely tying the main to the spar deck beam. It was also decided to run a double line of channel ties (on edge) on top of 'tween deck beams, at each side of and riveted to the channel stanchions, extending from hatch beam to hatch beam, and well riveted to the same. Double flanged brackets 4 feet long and 4 feet deep are fitted at each hatch beam, and securely riveted to the beam, channel ties and stanchion sides. This arrangement thoroughly renews the strength lost in removing the continuous stanchion from the hatch beam. The shifting boards are arranged to lap in between the channel tie and stanchion sides and are securely riveted thereto. Deck beams were raised about 9 inches from original plans, in order to give more clearance in the hold proper, and this necessitated the lengthening out of channel stanchion doublings, which, in the case of the stanchion nearest the hatch beam was made to extend to the top of channel ties and securely riveted to them. The side longitudinal stringer was also raised in proportion to the amount the 'tween decks were raised, and the stanchion struts raised in proportion to give longitudinal support to stanchions and flanged brackets. The fore-and-aft channel ties on top and under side of 'tween deck beams at side of hatches, were moved outboard 18 inches on each side and the struts between beams also in proportion; this made the hatch 3 feet wider in the clear, thus allowing the unloading machine to span clear out to the side of the ship.

AROUND THE GREAT LAKES.

Capt. B. B. Inman's retirement as manager of affairs of the Great Lakes Towing Co. at Duluth was due to difficulties that arose over the towing of vessels belonging to James Davidson of West Bay City.

The steamer Unique, a fast passenger vessel built for the Detroit-Port Huron route, is advertised for sale under mortgage foreclosure at St. Clair, Mich., June 12. The sale includes fittings, furniture and all of the boat's belongings.

Another elevator has just been opened in South Chicago. It is at 106th street and is known as the McReynolds Co.'s elevator A. The first vessel to take cargo from the new house was the Robert Mills. She was loaded with 95,000 bushels of corn in about three hours. Capacity of the new elevator is 1,500,000 bushels.

Capt. James Reid, who has become famous through his efforts during two or three years past to raise the steel steamer Cayuga, sunk in about 100 feet of water on Lake Michigan, says he will take up the job again this summer, probably renting for the purpose a number of air bags that are owned by the Mineralized Rubber Mfg. Co., 18 Cliff street, New York, and which were successfully used in raising the Spanish war vessel Maria Theresa, sunk at Santiago.

Commander Franklin Hanford of Buffalo, inspector of the tenth light-house district, is seeking the opinion of vessel men as to the advisability of re-establishing the so-called main light at Erie, Pa., which was discontinued some time ago. It is certain that this light, on account of its great elevation, was a very good coast light, and it was of great help to vessels making Erie harbor from the westward. They could run directly onto it in all kinds of weather, standing well out from the peninsula, until they found the harbor lights in range.

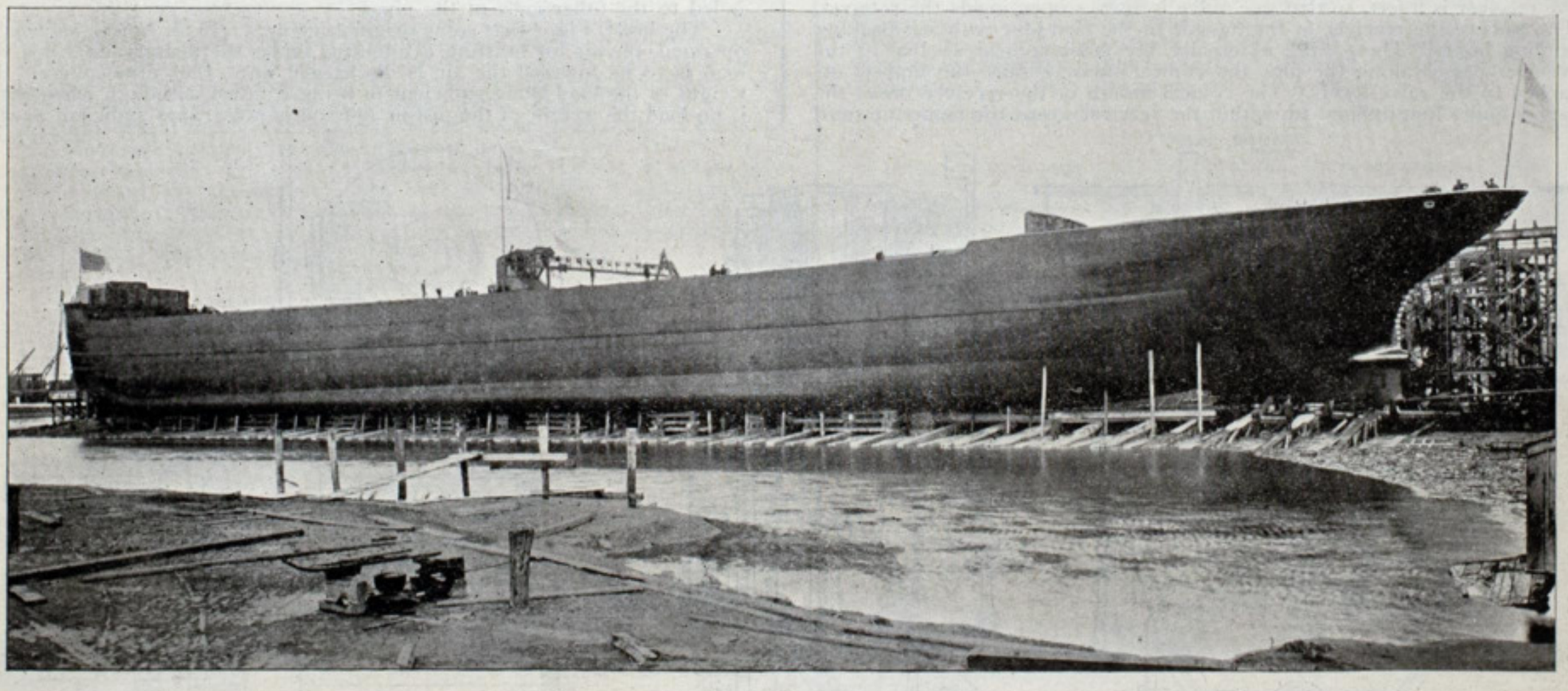
Major Thomas W. Symons, United States engineer in charge of river and harbor works at Buffalo, has just issued the following notice: "By direction of the secretary of war, all persons are hereby warned that it is dangerous to navigate the waters of the east end of Lake Erie between the southern end of the present Buffalo breakwater and Stony point, where the new breakwater is now under construction, and all persons so navigating do so at their own risk. And further, all persons are warned that the operations of the government contractors engaged in extending the breakwater must not be interfered with."

AN IMPORTANT NAVAL MANEUVER.

A highly important naval maneuver is in process of execution at the League Island navy yard. To ascertain how quickly vessels of the navy in reserve can be placed in commission, Secretary Long has given instructions to the battleships Indiana and Massachusetts to enter upon active service as quickly as possible and join the flag of Rear Admiral Farquhar. In explanation of the order Rear Admiral A. S. Crowninshield, chief of the bureau of navigation, said:

"I expect an effort will be made to ascribe some developments in the political situation to this maneuver. But there is nothing political in it, and any reports of this character will be without foundation. Every maritime nation directs a maneuver of this character every year. Great Britain mobilized fifty or sixty vessels last year. We ought to do it every year."

While the authorities say with Admiral Crowninshield that there is no political significance in the mobilizing, at the same time it is pointed out that the maneuver would be watched with considerable interest abroad. It is recalled that during the Fashoda affair, Great Britain mobilized her flying squadron and had it promptly prepared for action. Admiral Crowninshield expressed the opinion, when the order was given, that the Indiana and Massachusetts would be in commission and on their way to sea in forty-eight hours. Capt. F. W. Dickins is in command of the Indiana, and Capt. C. J. Train is in command of the Massachusetts.



CARNEGIE STEAMER LAFAYETTE ON THE STOCKS AT LORAIN, O.

SELF PROPELLING AIR HOIST WITH UNLIMITED TRAVEL.

The half tone Fig. 1 shows very clearly a novel and remarkable air hoist. The apparatus is all that the picture suggests. It is a complete air hoist which travels as far as the overhead rail extends in either direction, going around curves, or switching to other lines, as required, with a constant connection with the air supply, all under the control of the operator who rides with it. It is, however, not necessary for an operator to ride with the trolley, as it can be made to travel between points, starting and stopping automatically. In that case the hoist and motor are operated by pendants from the floor. The motor and the hoist, wherever they may be along the line, are both always in full connection with the air supply, and without any hose to look after or any outside connection.

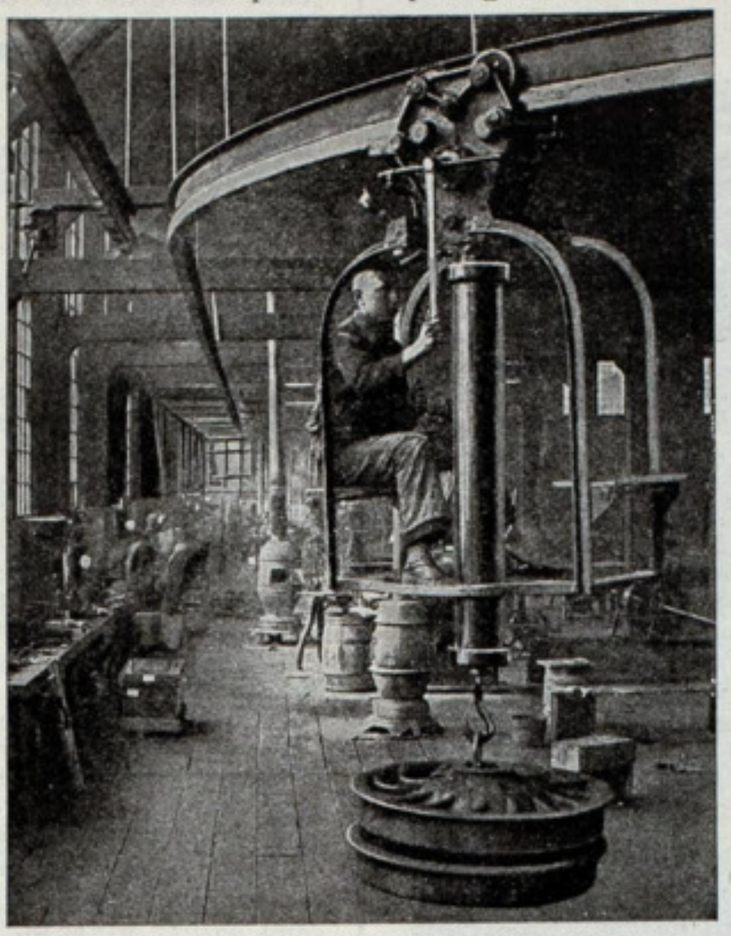


FIG. 1. SELF PROPELLING TRAVELING AIR HOIST.

The means by which the air supply is conveyed to the trolley and the connection constantly maintained will be understood from Fig. 2. Along the runway of I beams is suspended a feed pipe of cold drawn steel tube, and this is covered by a thin steel casing which normally is closed, but which is capable of springing apart at the bottom. The air tubes are in 8-foot lengths, and are joined together by couplings which form a bearing for a valve in each with the valve operating mechanism. The couplings and the pipe have a true and uniform continuous surface externally. Surrounding the air pipe is a flexible receiver of such diameter as to allow a given area between the outer wall of the feed pipe and the inner wall of the receiver. The receiver travels with the trolley, and connection is made to the trolley through a hollow arm which is a part of the receiver and extends down through the slot in the casing. The lengths of the feed pipe being 8 feet 6 inches from center to center of valves, the length of the receiver is 9 feet, so that one valve is always open inside the receiver. The ends of the receiver fit the outside of the feed pipe with self-packing stuffing boxes. These ends, externally, are made conical, so that as the receiver passes along the pipe the conical surfaces raise the tappets attached to the valve levers. The conical mouth of the receiver raises the tappet and a longitudinal rib within the receiver keeps the tappet up until it emerges at the other end of the receiver. When both tappets of either lever are up the valve connected with the middle of the lever is raised, and when the tappet drops the air valve is closed again. In Fig. 2, supposing the receiver to be moving to the left, the right-hand valve is seen to be open, and the first tappet of the left-hand valve lever has been raised. When the second tappet is reached and raised, the left-hand air valve will be open, and almost immediately, if the movement of the trolley and receiver continues, the right-hand valve will close, and thus the valves will be opened successively, and the pressure in the receiver will be maintained.

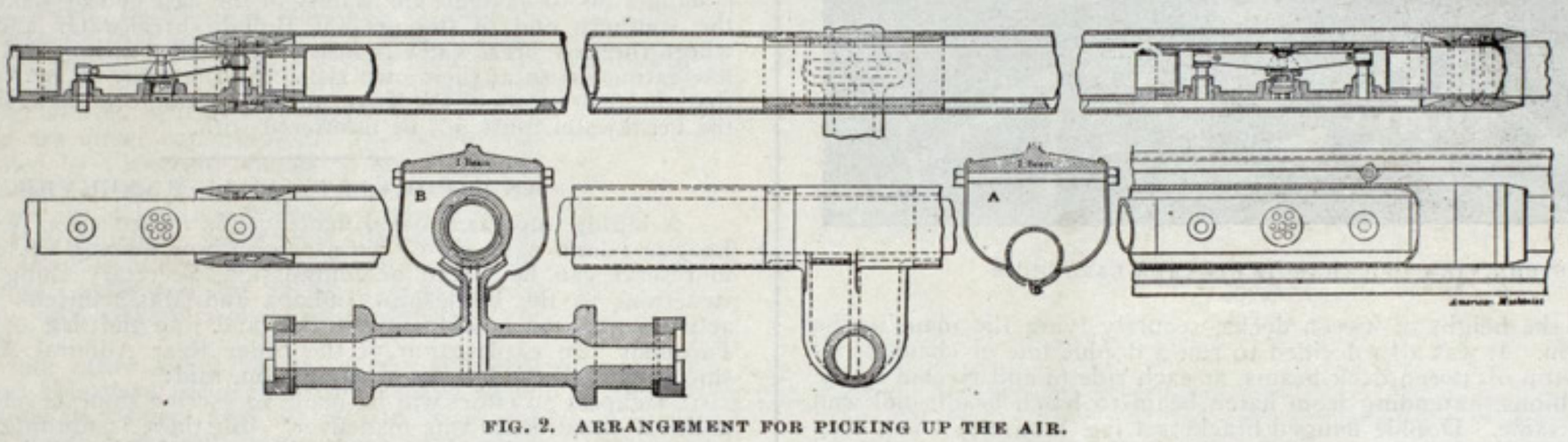


FIG. 2. ARRANGEMENT FOR PICKING UP THE AIR.

Fig. 3, showing the trolley and motor, requires little explanation here. The motor is of the three-cylinder type. With the pressure applied to the outer ends only of the cylinders the trolley can attain a speed of 400 feet per minute, if necessary. The motor runs at such a speed as to develop all the power required to move the trolley with its heaviest loads; the motor shaft carries a small pinion which connects with the largest gear, and small gears on the same shaft connect with intermediate gears that mesh into gears on wheels on both sides of the trolley. Levers for reversing and for the throttle are provided. After the air has done its work in the motor, instead of allowing it to exhaust into the atmosphere, it is led through another hollow arm back into the casing, which naturally creates a stronger air pressure flowing from within the casing than the atmospheric pressure without, thus preventing the possibility of dust settling on the feed pipe and valves. This exhaust air at the same time carries oil in the form of spray from the motor, which serves to keep the feed pipe well lubricated. At switching points the pipe casing and beam are broken in order to shift the main track to the switch track. The switch ends of the feed pipes are plugged, and the air supply is led to the other ends of the pipes.

The hoist, Fig. 4, has some original features. In air hoists, as usually operated, the air for hoisting is admitted under the piston, and when the load is to be lowered the air is discharged into the atmosphere, the weight of the load being sufficient to bring it down, although when there is no load the weight of the piston and rod is not always sufficient except

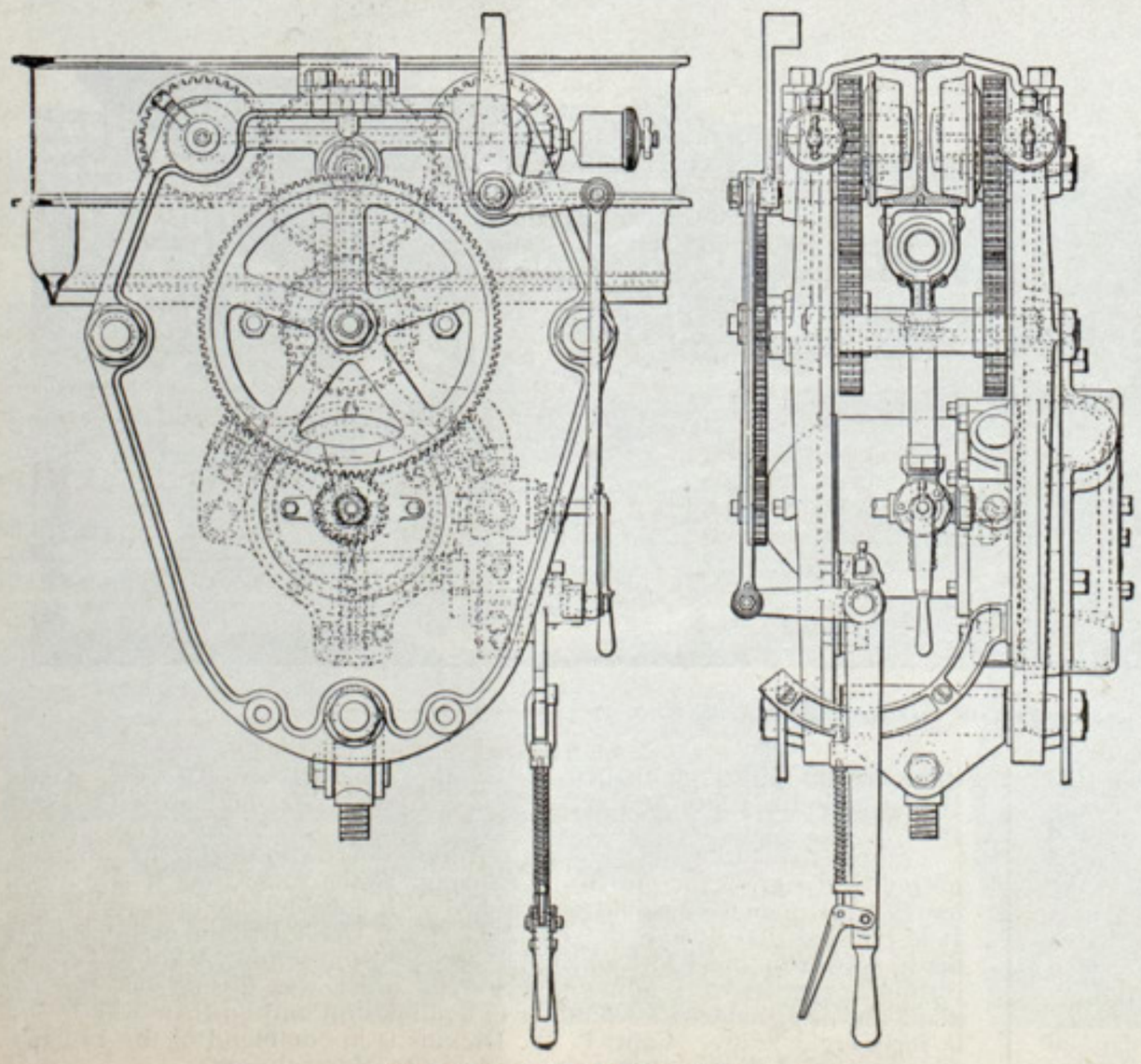


FIG. 3. TROLLEY AND MOTOR.

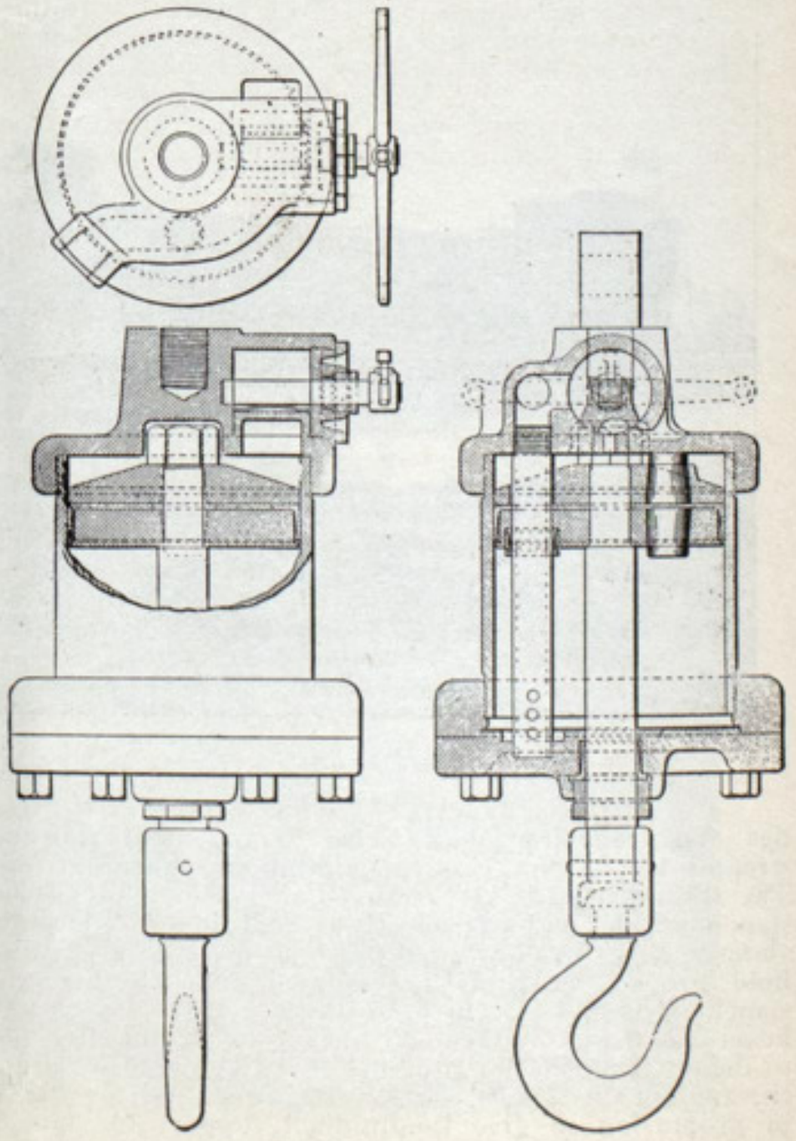


FIG. 4. DETAILS OF AIR HOIST.

for very slow movements. The usual air hoist, therefore, normally has no air pressure upon either side of the piston. In the present hoist there is full air pressure upon both sides of the piston, except when hoisting. The air pressure is conveyed to the lower side of the piston by means of the vertical pipe seen within the cylinder. The upper end of this pipe is in constant communication with the air supply and the lower end of it in as constant communication with the lower end of the cylinder. There is a stuffing box in the piston where this pipe passes through it. The piston also has on both sides of it a wooden block, which serves as a buffer and prevents the shock of metal to metal when the piston touches either end of the cylinder. No operating valve is connected to the lower end of the cylinder. When a load is to be hoisted the pressure is released from the upper side of the piston and the hoist ascends. For lowering, the pressure is readmitted above the piston. When the pressure is on both sides of the piston there is an unbalanced pressure downward equal to the area of the piston rod below, and this differential pressure operates in addition to the weight of the parts to cause the piston to descend. This apparatus is made by the Pneumatic Crane Co., Pittsburgh, Pa.

A PROTEST FROM REAR ADMIRAL CROWNINSHIELD.

Rear Admiral A. S. Crowninshield, chief of the bureau of navigation, a few days ago addressed to the secretary of the navy a communication which is an emphatic protest against the senate amendment to the naval appropriation bill providing that retired officers of the navy may be assigned to active service in time of peace. This amendment has created much concern in naval circles, where its possible far-reaching effects on discipline and efficiency are realized, and the views of Admiral Crowninshield probably reflect those of officers on the active list, generally, and a large proportion of retired officers, who would find their status surrounded by uncertainty should the amendment be enacted into law. Immediately on receipt of Admiral Crowninshield's letter Secretary Long forwarded it to the naval committees of the senate and the house, with a note in which he said:

"I concur in his (Admiral Crowninshield's) suggestion that it (the amendement) should be so modified as to limit the employment therein provided for of retired officers to those who have not been retired for age or after forty years' service."

Admiral Crowninshield in his letter says: "It (the amendment) really amounts to the abolition of the retired list of the navy, as it abolishes all of its privileges. The objection to such a measure as applied, especially to the older officers on the retired list, is the great uncertainty that will always exist with such officers regarding their status. The state of rest to which they are entitled from their age or longer service, and which they were promised on their entry into the service, will be done away with and they will never know from one day to another when their liberty or retirement may be disturbed. The probable effect of the proposed legislation upon the efficiency of the whole body of the navy is most serious and should receive careful consideration. In the first place it will be a blow at the esprit de corps, which will so weaken it by internal jealousies and dissentions that the efficiency of the body will be greatly injured. Officers on the active list, trained to subordination to those whom they consider properly placed over them by law, will find it very hard to give cheerful obedience to officers who during the years of recent advancement in naval matters have been passing their time on the retired list, out of all touch with all modern naval matters and exempt from the hardships of the service. It would be quite possible that by the operation of such a law in certain of its applications, an officer of long experience as a captain might find himself superseded by a man who had been retired about the time he went on the captain's list. Again, there will be an inevitable confusion in regard to all matters of rank and precedence. An officer retired years ago as an ensign, whose classmates may now be captains, might find himself serving under junior lieutenants, lieutenants, and lieutenant commanders who graduated from the naval academy many years after he did. For these, as well as for other reasons, it will be wise to strike out the amendment, or at least to so modify it as to limit the employment of retired officers to those who have not been retired for age or after forty years' service, and who, on being examined by professional and medical examining boards, are reported fit for duty."

SERIOUS FIRE AND THRILLING RESCUE.

Capt. Walter Scott, marine solicitor for George B. Carpenter & Co., ship chandlers of Chicago, made a thrilling rescue on May 26 when the building of the firm was destroyed by fire. The fire started on the third floor and spread with great rapidity. About fifty girls, who are employed upon this floor, managed to escape without injury. One of them, however, became suffocated in the dense smoke and was in imminent peril. Capt. Scott fought his way through the smoke and flame to her and carried her to the ground. Her clothing had just begun to ignite when Capt. Scott rescued her. The loss on stock amounted to $75,000 and on building $15,000, both fully covered, however, by insurance. The firm carried a duplicate stock in their warehouse and immediately opened new quarters directly across the street from the burned building. Mr. George B. Carpenter, the senior member of the firm, had only just landed in New York from a six months' trip abroad when he was notified of the fire. He instantly wired back "Hoist the colors over the old house," which was done. The firm is the oldest in Chicago, having been established in 1840.

WEBB'S ACADEMY AND HOME FOR SHIP BUILDERS.

The commencement exercises of Webb's Academy and Home for Ship Builders at Fordham Heights, New York, will be held in the chapel of the institution on Friday afternoon, June 8. Mr. Stevenson Taylor, president of the board of trustees, will preside. The address to the graduates will be delivered by the Rev. W. S. Crowe, D. D. The graduates will receive their diplomas from Mr. Thomas Fitch Rowland, the builder of the original Monitor. The class oration will be by Philip B. Brill.

The recent death of the founder, Mr. William H. Webb, will make the occasion of more than usual significance, as his life-long friend, the Hon. Andrew H. Green, will deliver a memorial address on his life and service.

ENORMOUS MOVEMENT OF FREIGHT.

REPORTS FROM CANALS AT THE SAULT SHOW THAT SHIPMENTS OF SOME COMMODITIES MOVING TO AND FROM LAKE SUPERIOR ARE ALMOST DOUBLE WHAT THEY WERE ON JUNE 1 A YEAR AGO.

An enormous movement of freight was, of course, planned for the great lakes during the present season, but the gains thus far are largely in excess of what was expected. Reports from both canals at the Sault Canadian and American) show a total movement of freight to and from Lake Superior that is 37 per cent. in excess of what it was on June 1 a year ago. It must be noted, however, that a large part of this gain is due to the earlier opening of navigation this year. The total freight figures are: To June 1, 1900, 4,565,879 tons (net tons in all cases); to June 1, 1899, 2,908,068 tons; to June 1, 1898, 3,372,347 tons; to June 1, 1897, 2,204,955 tons. Soft coal shipments to all Lake Superior ports, aggregating 724,958 tons to June of this year, are more than double what they were on the same date a year ago. East bound shipments of wheat from all ports at the head of the lakes, foot up 14,216,221 bushels, against 8,443,388 bushels on June 1, 1899, but of grain other than wheat there has been moved thus far this year only 2,383,301 bushels, against 8,335,892 bushels at the same time a year ago. Following is a full summary of the canal statistics:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To June 1, 1900.	To June 1, 1899.	To June 1, 1898.
Coal, anthracite, net tons	155,082	128,789	62,821
Coal, bituminous, net tons	724,958	317,201	576,009
Iron ore, net tons	2,733,525	1,619,394	1,824,595
Wheat, bushels	14,216,221	8,443,388	5,751,941
Flour, barrels	1,194,183	773,238	1,419,270

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO JUNE 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

ITEMS.	Designation.	To June 1, 1900.	To June 1, 1899.	To June 1, 1898.
Copper	Net tons	19,423	10,833	26,790
Grain, other than wheat	Bushels	2,383,301	8,335,892	8,797,647
Building stone	Net tons	2,396	923	445
Flour	Barrels	1,194,073	773,238	1,419,270
Iron ore	Net tons	2,733,525	1,619,394	1,824,595
Iron, pig	Net tons	2,744	2,347	8,149
Lumber	M. ft. b. m.	120,832	97,266	122,261
Silver ore	Net tons	.....	.....	.....
Wheat	Bushels	14,216,221	8,443,388	5,751,941
Unclassified freight	Net tons	8 364	28,347	44,442
Passengers	Number	1,723	867	858

WEST BOUND.

Coal, anthracite	Net tons	155,082	128,789	62,821
Coal, bituminous	Net tons	724,958	317,201	576,009
Flour	Barrels	110	.....	42
Grain	Bushels	.....	4,000	250
Manufactured iron	Net tons	24,838	17,043	41,349
Salt	Barrels	67,217	75,465	44,749
Unclassified freight	Net tons	77,603	67,838	72,224
Passengers	Number	1,730	1,443	1,432

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To June 1, 1900.	To June 1, 1899.	To June 1, 1898.
East bound freight of all kinds, net tons	3,573,228	2,365,806	2,614,295
West bound freight of all kinds, net tons	992,651	542,262	758,052
	4,565,879	2,908,068	3,372,347

Total number of vessel passages to June 1, 1900, was 3,348 and the registered tonnage 4,126,717.

EARNINGS OF THE CRAMPS.

The annual meeting of the William Cramp & Sons Ship & Engine Building Co. of Philadelphia was held last week. The gross earnings for the year ending April 30, 1900, were $7,791,500, as against $5,300,000 last year. The net profits were $913,000 and the net earnings applicable to dividend $536,262, an increase of $205,612 over last year. The ratio of general expense to gross earnings was 4.85, as against 5.85 per cent. in the previous year. The report shows a surplus of assets over all liabilities of $1,848,044. The total ledger assets figured show about $11,000,000. The company has on hand at present $20,341,000 worth of contracts, of which there are yet to be finished $12,212,000. An officer says he expects the company to do $90,000,000 worth of work on contracts this year.

NOTES FROM LAKE SHIP YARDS.

The new passenger steamer Pittsburg, building at Collingwood, Ont., for the Windsor, Detroit & Sault line will leave Collingwood in about two weeks to receive cabin and stateroom outfit. The Pittsburg is built of wood and is strengthened by 25 tons of steel strapping, and the Canadian inspectors have pronounced the hull one of the strongest in Canadian waters. The new boat is 232 feet length at water line, 242 feet over all, 45 feet beam to the guards and 13 feet depth. She has two decks and her 125 staterooms will carry 265 persons. The dining room and main saloon will be on the main deck. The vessel is designed to develop a speed of 13 knots. Her first trip will be made June 18.

In advertising matter of the Union Dry Dock Co. of Buffalo the names Chemung, Owego, America and Brazil were very familiar in the past. Now it is Buffalo, Wilkes-Barre, Starucca and Codorus. The Union company has certainly built some of the finest vessels on the lakes. There are none of the freight kind better than those just mentioned. Other claims now made by the Union company are: "The best place in Buffalo for prompt and economical repairs; two dry docks, with most modern machinery, electrically driven, in all parts of the works; electric light plant, so that work may be carried on night and day.

The steamer A. B. Wolvin, second of the Welland canal size steamers building for the American Steamship Co. by the American Ship Building Co., will be launched at the Globe yard, Cleveland, Saturday morning at 10 o'clock. The Wolvin is an exact duplicate of the steamer W. P. Palmer of the same line which was launched at the Globe yard a few weeks ago. Mrs. H. G. Dalton will christen the new vessel. The principal stockholders of the American Steamship Co. are officials of the American Steel & Wire Co. and Mr. Wolvin is general manager.

The steel tow barge Bryn Mawr, building at the works of the Chicago Ship Building Co. for the Pittsburg Steamship Co. (Carnegie), will be launched next Tuesday afternoon at 3 o'clock. This vessel is 414 feet length over all, 50 feet beam and 27 feet depth of hold. She will carry about 5900 gross tons on a draught of 18 feet. The Cornell, a steamer of the same fleet building at the Chicago yard, will be launched July 1. This ship measures 474 feet over all, 50 feet beam and 28½ feet depth.

Shelby cold-drawn steel tubes, manufactured by the Shelby Steel Tube Co., are used in the Babcock & Wilcox water tube boilers that are being installed in the several large freight steamers building in different yards of the American Ship Building Co. for the Pittsburg Steamship Co. (Carnegie) and for A. B. Wolvin and others.

A wooden freight steamer of about 2,800 tons capacity and which is to cost about $100,000 will be launched in a few days from the ship yard of Simon Langell, St. Clair, Mich., and will be named Alfred Mitchell in honor of Capt. Alfred Mitchell of Mitchell & Co., Cleveland.

The Nickel Plate road offers special low rates to Milwaukee, Wis., account biennial meeting General Federation of Women's Club. Tickets sold June 1 to 4 inclusive; good returning until June 11, or by deposit until June 30 inclusive. Call on or address E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 68 June 4.

LAUNCH OF THE STEAMER JAMES S. WHITNEY.

The Harlan & Hollingsworth Co., Wilmington, Del., launched on Monday the steel, single-screw freight steamer James S. Whitney for the Metropolitan Steamship Co. of New York city. The Whitney will ply between New York and Boston. This is the second vessel built by the Harlan & Hollingswoth Co. for the Metropolitan company. The first was the steamer Gen. Whitney, built some years ago. The new vessel will conform to the American Shipmasters' rules for highest rating. She is 288 feet 8¾ inches over all, 43 feet beam, moulded, and 29 feet depth to awning deck. Her motive power consists of a triple expansion surface condensing engine of 29, 46 and 75 inches cylinder diameters and 46 inches stroke, supplied with steam by four Scotch boilers of 13 feet length and 14 feet diameter. The boiler pressure is 175 pounds. Deck houses are of wood with accommodations for twenty-one sailors and firemen and twenty-three officers and passengers. The joinery is of soft wood, tastefully painted. There are in the hull six water-tight bulkheads, four hatches and eight side ports. The equipment includes six winches, a Hyde windlass and capstan and a complete electric lighting plant. The vessel carries two steel masts. She has a complete outfit of Blake pumps, including vertical simplex twin air pumps for the main condensers and vertical simplex tandem compound feed and ballast pumps.

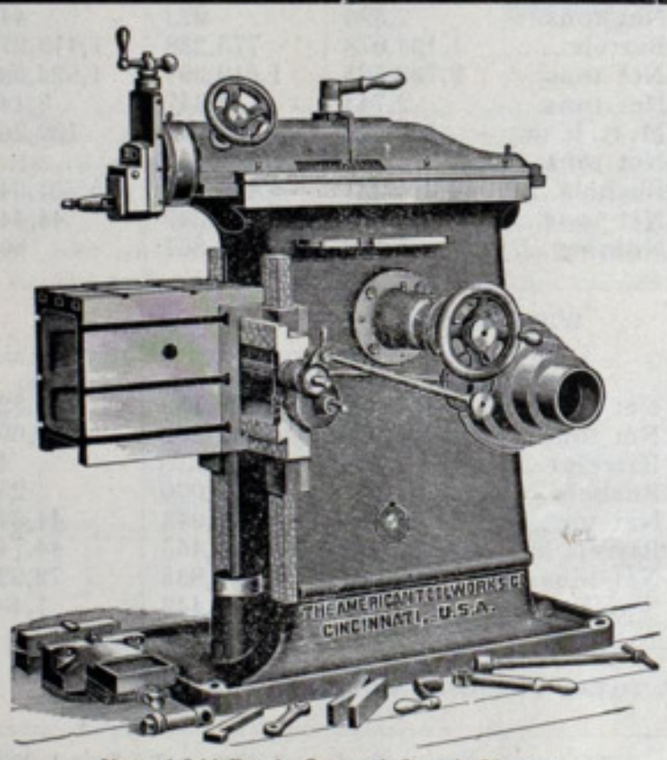
This is the seventh ship launched at the yards of the Harlan & Hollingsworth Co. since the first of the year. The others were the Grecian for the Boston & Philadelphia Steamship Line; the Chesapeake and Manna-hata for the New York & Baltimore Transportation Line, and the three Pennsylvania Railroad tug boats, Wilmington, Johnstown and Harrisburg, which are now rapidly nearing completion.

The Harlan & Hollingswoth Co. has now under construction in addition to the Whitney, two 29-knot torpedo boat destroyers (Hopkins and Hull) which are now practically plated up; a 212-foot twin-screw steam yacht for Charles Fletcher of Providence, R. I.; a 400-foot steamer for the Mallory Line, which is one of the same type; six 200-foot barges for the Rockland-Rockport Lime Co.

The stage of water in Lake Superior last month was 0.17 foot lower than in May, 1899, which was a high water year, but is still 0.33 higher than the average May stage for twenty-six years from 1872 to 1897. For this fact credit should be given to last year's abundant supply, which has not yet entirely run off.

The steam barge Kewaunee was launched at Kewaunee, Wis., last week. She was built by Kohler, Smith & Kuhlman, and measures 108 feet over all, 90 feet keel, 24 feet beam and 7 feet depth.

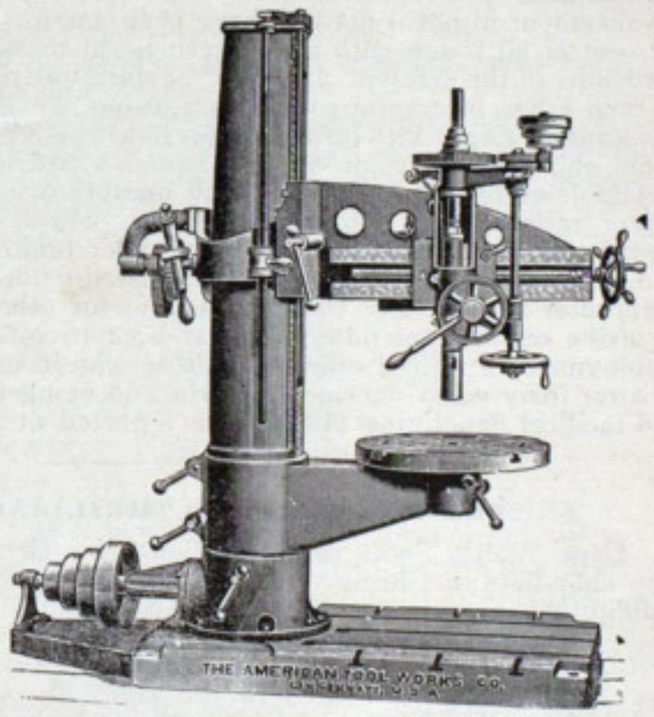
The Nickel Plate road offers low rates to Des Moines, Ia., account annual convention Music Teachers' Association. Tickets good going June 17 to 21 inclusive, and good returning not later than June 23, 1900, at one fare for the round trip. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 83 June 14.



New 16″ Back Geared Crank Shaper.

Machine Tools

LATHES, PLANERS, SHAPERS,
BORING and TURNING MILLS,
UPRIGHT and RADIAL DRILLS,
SCREW MACHINES,
PULLEY LATHES,
BOLT CUTTERS, Etc.



3′ Radial Drill.

The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway, Geo. Place, Agent.
NEW ORLEANS: The Fairbanks Co.
CHICAGO STORE: 68-70 South Canal Street.
PHILADELPHIA: The Fairbanks Co.
CLEVELAND: The Strong, Carlisle & Hammond Co.
BOSTON STORE: 36 Federal Street.
BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley & Co.
DENVER AND SALT LAKE CITY: The Mine & Smelter Supply Co.
LONDON: Alfred Herbert, Ltd., 7 Leonard St., Finsbury, E. C.
DÜSSELDORF: de Fries & Co., Act. Ges., Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Freres, 33 Rue des Peignes.
BERLIN: de Fries & Co., Act. Ges., Kloster Strasse, 13-15.
PARIS: Roux Fréres & Cie., 54 Boulevard du Temple.
MOSCOW: Alfred Stucken.

TRADE NOTES.

Architects, consulting engineers, owners and persons interested in the subject of protective paint for steel structures, will receive a handsome card illustrating several eighteen-story steel structures upon which Dixon's silica-graphite paint has been used, if they will send their address to the Joseph Dixon Crucible Co., Jersey City, N. J. The card also contains suggestions for specification of the paint.

At the Kingsford Foundry & Machine Works, Oswego, N. Y., the boiler plant is running with a full force of men, while the machine department is extremely busy on centrifugal pumping machinery, and vertical stationary and marine engines. Recent shipments of large pumps have been made to Japan, Mexico and the Cape Nome district, at which latter place they are used on the beach for dredging purposes.

Referring to an order which they have just received from one of the lake ship yards for six more of their patent beaded galvanized steel life boats, Thos. Drein & Son of Wilmington, Del., say: "These boats are of 22 feet length. They are practically of the same type that we have been shipping to lake builders for fifteen years. We have, of course, improved them at different times, but the essential features of their construction have not changed. They are used on steamers, tow barges, tugs, and in fact all kinds of vessels. We keep in stock boats of 12 to 26 feet length and can ship on demand."

The Rusden Machine Co. of Warren, R. I., has just issued a book catalogue of ninety pages devoted to its marine department. This company manufactures a patent steam steering gear, windlasses, capstans, steam and electric coal hoists, Chase patent coal elevators and a complete line of yacht windlasses and marine machinery. The company recently acquired all the machine shop property and patents of the Chase Elevator and Manton Windlass companies and the Warren Steam Steerer & Elevator Co. The book is strikingly illustrated with photographs of the output of the company and also contains some excellent half tones of coal docks equipped with their coal handling elevators.

The Standard Pneumatic Tool Co. of Chicago and New York, has just issued a Paris exposition special edition catalogue. It is a superbly illustrated pamphlet of sixty-five pages. The company claims for its tools economy in the use of air, lightness of weight, simplicity of construction and excellence of workmanship. The first page contains a picture of the company's factory in Chicago in 1898, a building of 256 square feet, and their factory in 1900 at Aurora, Ill., a building of 11,400 square feet. The first tool to be illustrated in the catalogue is the "Little Giant" piston air drill and this is followed by drill and motor, breast and screw feed drill, reversible flue rolling machines, pneumatic riveters, pneumatic stay bolt cutters, pneumatic chain hoists, pneumatic jacks and all kinds of pneumatic tools and appliances. The half tone reproductions are some of the best the Review has ever seen.

NAVAL MATTERS.

The navy yard at Havana, which has been under the control of the navy department since the occupation of that city by the United States forces, has been turned over to the army at the request of the secretary of war.

The cruiser Detroit, now at Portsmouth (N. H.) navy yard, is said to be in very bad condition. Her plates are damaged, rudder twisted, and she has about 2 feet of water in her hold. She has just been put out of commission.

A general survey of the U. S. S. Alliance will be held at the New York navy yard in the next few days. It is possible that the vessel will be in need of such repairs as to put the cost beyond the limit allowed by law. The vessel therefore may be taken off the naval list.

None of the ships of the South Atlantic Squadron will be sent to the South African coast. Rear Admiral Schley will remain on the station during the summer. None of the foreign governments are sending ships to Delago bay and the administration does not desire to have a naval representation in that part of the world during the present conflict in the Transvaal.

Admiral Aduplessis de Richelieu of the Siamese navy, accompanied by John Barrett, ex-United States minister to Siam, visited the navy yard in Brooklyn this week. They were escorted around the yard by Capt. Frank Wildes, Commander Henry W. Lyon and Lieutenant-Commander John A. H. Nickels. The party visited the various shops, the dry docks and the big battleship Kearsarge.

Upon the subject of transferring the transport service from the war department to the navy department, Representative Levy said the other day before the committee on military affairs: "The transport service should be no part of the army proper. This bill simply throws the responsibility of the care of the transports upon the navy department, where it properly belongs. Had this department been in operation during the war with Spain none of the ill effects of the transportation of troops and horses would have occurred. I venture to assert that no other nation of the world has her transports under the army branch of the service. I believe that I am safe in saying that army officers would be glad to be relieved of the duties connected with the transportation service, which, not being in the line of their duty, must be irksome to them."

The Nickel Plate road will sell low rate excursion tickets to North Manchester, Ind., account annual meeting of German Baptists (Dunkards) at one fare for the round trip. Tickets good going on May 29 to June 4 inclusive, beyond a radius of 100 miles, and on May 31 to June 8 within a radius of 100 miles from North Manchester, Ind. Good returning until June 10, or by deposit until July 5 inclusive. Call on or address E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 67 June 4.

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAULT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LÉGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS, SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY, AMIRAL AUBE** and **MARSEILLAISE**.

COMP. GENERALE TRANSATLANTIQUE: X (type Caen) **LAQUEBOT**.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH, AUSTRALIEN, POLYNESIEN, ARMAND-BEHIC, VILLE-DE-LA-CIOTAT, ERNEST-SIMONS, CHILI, CORDILLERE, LAOS, INDUS, TONKIN, ANNAM, ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS, CAEN, BREST, CHERBOURG**; Fast Steamers **TAMISE, MANCHE, FRANCE**.

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PULLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**; Iron Clad **SINOPE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGUE**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser; **X', X'"**, battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, battleship.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRATE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **GENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship; **TZUMO**, cruiser.

UNITED STATES OF AMERICA.

Northern Steamship Co.'s Passenger Steamers **NORTH WEST** and **NORTH LAND**, of 7,000 H. P. each; yachts **SHEARWATER, CORYELL, WILD DUCK, SULTANA**.

Cable Address: BELLEVILLE SAINT-DENIS-SUR-SEINE. **General Information Sent on Demand.**

STATEMENT FROM JAMES DAVIDSON.

In view of numerous erroneous reports in the newspapers regarding the relations of Capt. James Davidson of West Bay City to the Great Lakes Towing Co., Capt. Davidson has given out for publication the following written statement:

"In justice to the Great Lakes Towing Co. and also to myself, I wish to make a general denial of the impossible and absurd rumors that have appeared in the newspapers during the past ten days. There is not now, and never has been, any friction or disagreement between the officers of the Great Lakes Towing Co. and myself, and as an officer of the Great Lakes Towing Co. and member of the executive board, I shall at all times do all that I can for the interest and success of that venture. There is not now and never has been any disagreement between myself and the tug captains of the tug men's union, and having a personal acquaintance with the men, I have no hesitancy in saying they perform their services faithfully and will do all in their power to co-operate with the tug owners in rendering the most efficient service. I have not offered for sale a single dollar of my stock in the Great Lakes Towing Co., either common or preferred, but on the contrary have refused all offers made, and have stated to the brokers that the stock was not for sale.

"The only difficulty experienced by me was of a local nature in matter of detail at Duluth. As is generally known, the port of Duluth is one of the finest harbors on the lakes. For some years I was engaged in the towing business there and had no difficulty in handling ordinary sized vessels by means of one tug. Captains of vessels and owners ought to receive some consideration as to whether in their judgment one or two tugs are necessary. If conditions are favorable and one tug can do the work, the vessel ought not to be compelled to take two tugs, thereby incurring additional and useless expense.

"In conclusion, I wish to state, that the Great Lakes Towing Co. was organized as a co-operative company. All of its stock is now held by vessel owners and those having kindred interests. It is the intention of the company to render towing service of the greatest efficiency and at the lowest possible cost and to correct all abuses and imperfections at all of the lake ports just as rapidly as possible. All ships controlled by me are using the tugs of the Great Lakes Towing Co. at all lake ports, including Duluth."

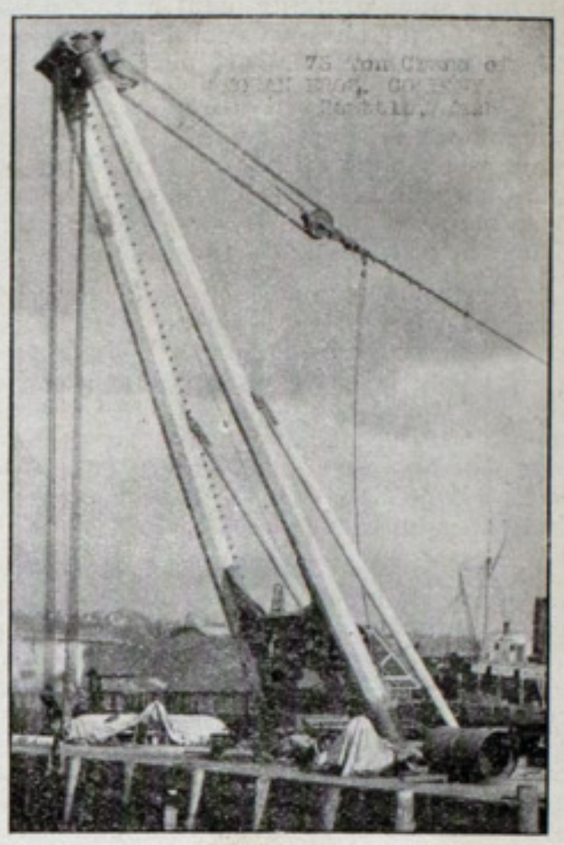
MARQUETTE, ON LAKE SUPERIOR,

is one of the most charming summer resorts reached via the Chicago, Milwaukee & St. Paul Railway. Its healthful location, beautiful scenery, good hotels and complete immunity from hay fever, make a summer outing at Marquette, Mich., very attractive from the standpoint of health, rest and comfort.

For a copy of "The Lake Superior Country," containing a description of Marquette and the copper country, address, with four (4) cents in stamps to pay postage, Geo. H. Heafford, General Passenger Agent, Chicago, Ill. July 26

SHIP YARD OF MORAN BROS. CO.

A crane or shear legs of large capacity is a valuable adjunct to a ship yard for its own use in handling boilers, machinery and other heavy material, but this is especially true in the Seattle and Tacoma district on Puget sound where general development of a new country has been going on for a long time past and where such a device may very often be used for purposes other than ship building. Attention is therefore directed to an electric crane of 75 tons capacity, in operation at the works of the Moran Bros. Co., Seattle, Wash., and which is illustrated herewith. The capacity of this crane is in fact considerably in excess of 75 tons, as the factor of safety on that basis is five. Works of the Moran Bros. Co. are centrally located and may be entered by cars from all transcontinental roads. These works are thoroughly equipped for the construction of all kinds of vessels and machinery. Vessels are built for ocean, sound or river service. The foundry, machine, boiler and forge shops contain tools equal to any requirement. Heavy forgings are a specialty with the company. A two-section balanced floating dry dock of 12,000 tons displacement is 400 feet long and 60 feet between towers, with patent steel wedge keel blocks, and a marine railway at the works is of 1,500 tons capacity. A large saw and planing mill is also a part of the plant, and the company makes a specialty of long and large timber. They can dress four sides 20x30 inches. Spars, rough or hewn, the best to be found in the world, are provided by these works.



Having confirmed its own title to Dry Tortugas and initiated the work of establishing a naval station there, the navy department has now suspended work for the summer and turned the islands over for that season to the marine hospital service for use as a quarantine station. This has been done because the hospital service has not been able to otherwise provide itself with a station at the short notice afforded by the transfer of the islands to the navy department.

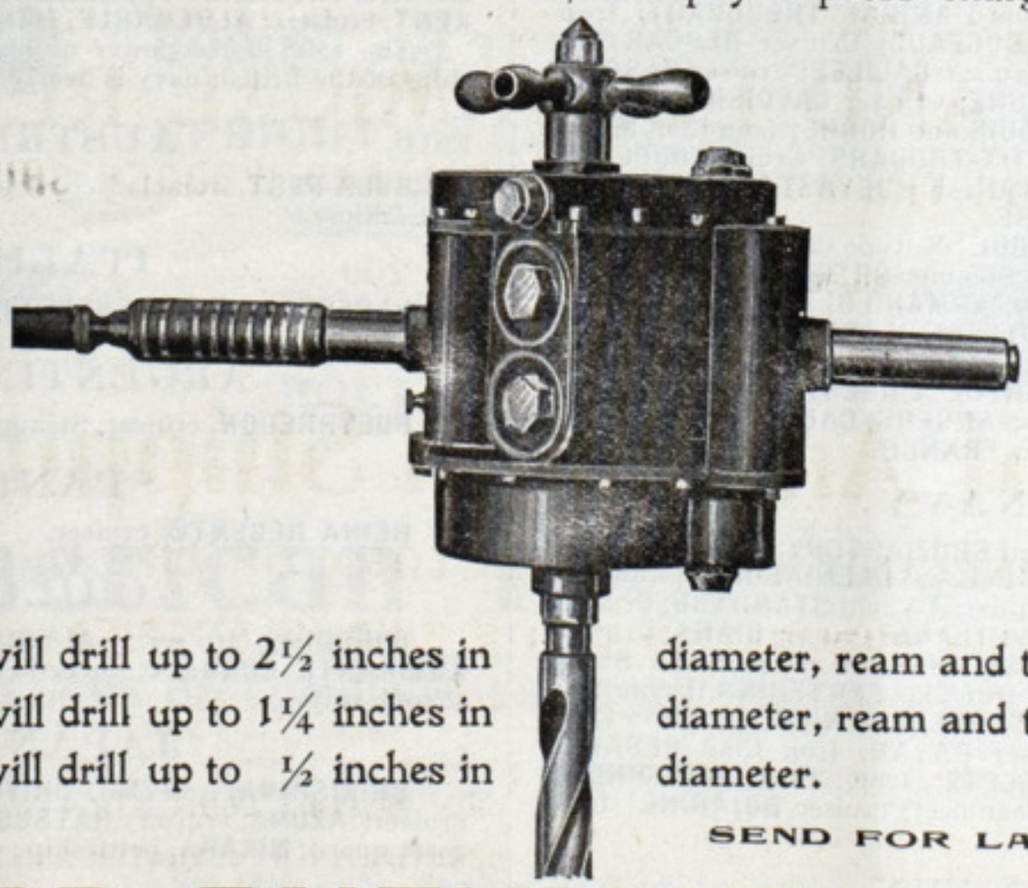
THE ONLY PISTON AIR DRILLS

That have Double-Balanced Piston Valves are the

"LITTLE GIANT"

SPECIALLY DESIGNED FOR SHIP BUILDING.—They consume fifty per cent less air and do far more work than rotary or any other type of air drills. If you want to verify this we will send a machine on trial, and pay express charges both ways.

Our Machines are made to withstand hard service. They can be operated in a bath of oil. Used by 85 per cent of the railways in this country. Absolutely no vibration.



Guaranteed against repair for one year. Made entirely of steel. Can be operated close to a corner and in any position. We can furnish them in any size.

No. 1.—Weight 27 lbs., will drill up to 2½ inches in diameter, ream and tap up to 2 inches.
No. 2.—Weight 17 lbs., will drill up to 1¼ inches in diameter, ream and tap up to 1 inch.
No. 3.—Weight 8 lbs., will drill up to ½ inches in diameter.

SEND FOR LATEST CATALOG.

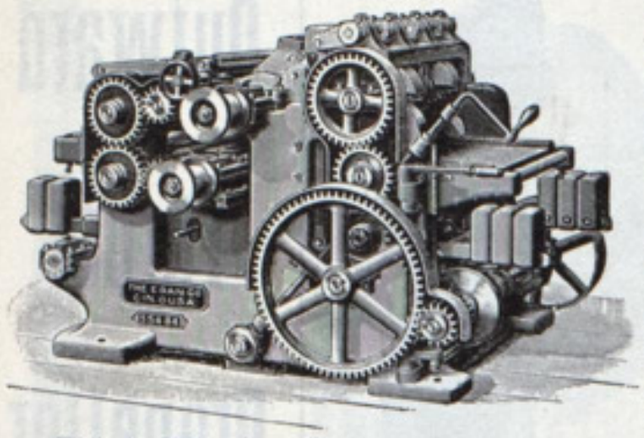
STANDARD PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools of All Kinds,

Marquette Building, CHICAGO. 141 Broadway, NEW YORK.

DOUBLE CYLINDER SURFACER.

A machine just placed on the market by the Egan Co. of 325 to 345 West Front street, Cincinnati, and patented Dec. 19, 1899, is illustrated herewith. It is what is known as the Egan Co.'s No. 18 double-cylinder surfacer. It is designed for general use and the following advantages are claimed for it:



First. It has broken rolls and broken pressure bar. Each section is centre-geared and works independently, and is very powerful.

Second. The lower head comes immediately after the upper.

Third. The lower head can be drawn out on the side of the frame for convenience in sharpening and the pressure bar comes with it.

Fourth. It is a self-contained machine, with feed inside, and can be made to feed faster, slower, or stopped, all with the same lever.

This machine is made in three sizes, to plane 24, 27 and 30 inches wide and 8 inches thick, and for ship yards, carriage and wagon shops, box factories and wherever hardwood is used, the manufacturers pledge their reputation that it will meet the requirements of the best users. Further particulars will be readily furnished to intending buyers.

A contract for the construction of the San Pedro breakwater has been let by the secretary of war to the California Construction Co. for $2,375,000.

U. S. Engineer Office, Jones Building, Detroit, Mich., May 29, 1900. Sealed proposals for improving Detroit river—including dredging, removing boulders, and excavating bedrock—will be received here until 12 noon (Standard time), June 13, 1900, and then publicly opened. Information furnished on application. G. J. Lydecker, Lt. Col., Engrs. June 7.

U. S. Engineer Office, Vicksburg, Miss., May 28, 1900. Sealed proposals for excavating 7,500,000 cubic yards of earth, more or less, along route for diverting mouth of Yazoo River, near Vicksburg, Miss., will be received here until 3 o'clock, p. m., June 28, 1900, and then publicly opened. Information furnished on application. Thos. L. Casey, Major, Engrs. June 21.

U. S. Engineer Office, Galveston, Tex., May 30, 1900. Sealed bids in triplicate, for Improving Galveston Ship Channel and Buffalo Bayou, Tex., by dredging, etc., will be received until 2 p. m., June 30, 1900, and then publicly opened. For information apply to C. S. Riche, Capt., Engrs. June 21.

U. S. Engineer Office, Customhouse, Cincinnati, O., May 16, 1900. Sealed proposals for hire of one or more Dredging Plants, each consisting of one Dredge, one Towboat and Three Dump Scows, for use on Ohio River, will be received here until 2 p. m., June 15, 1900, and then publicly opened. Information furnished on application. Wm. H. Bixby, Maj., Engrs. June 7.

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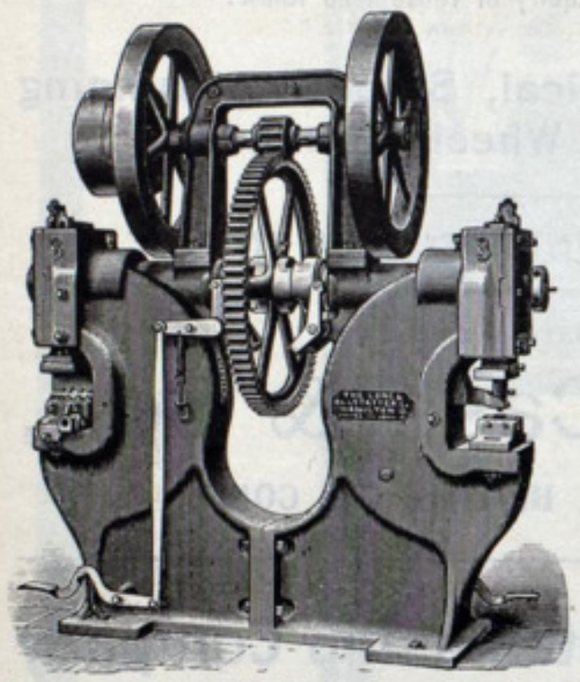

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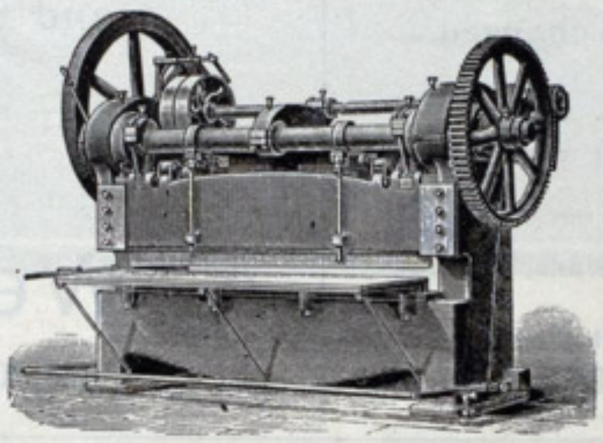

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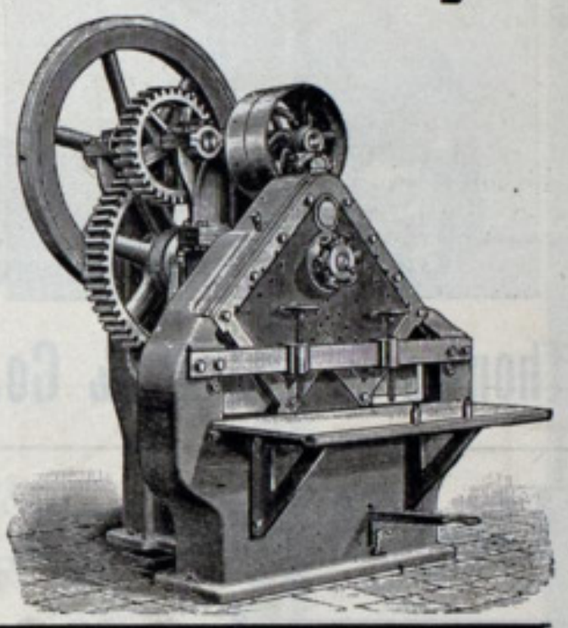

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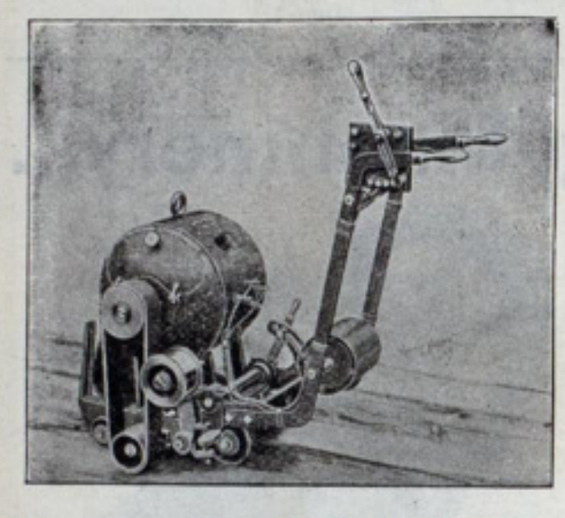

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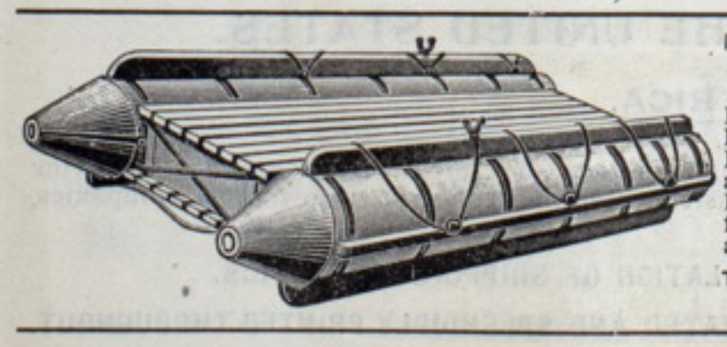

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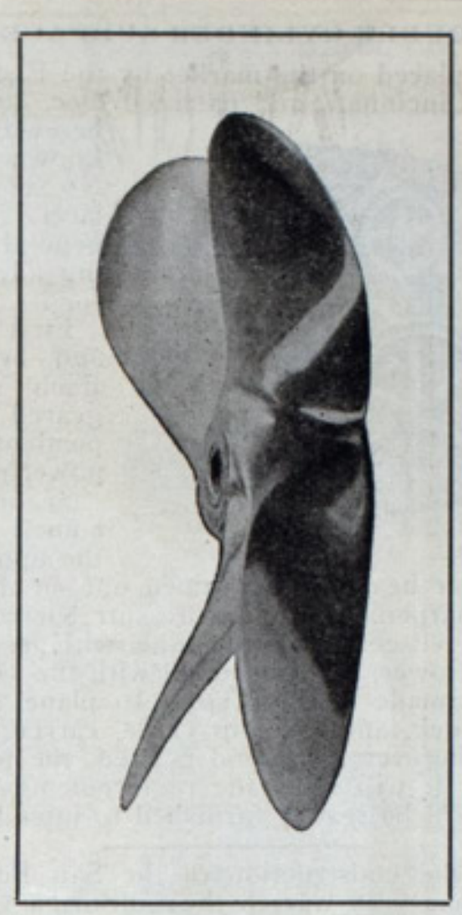

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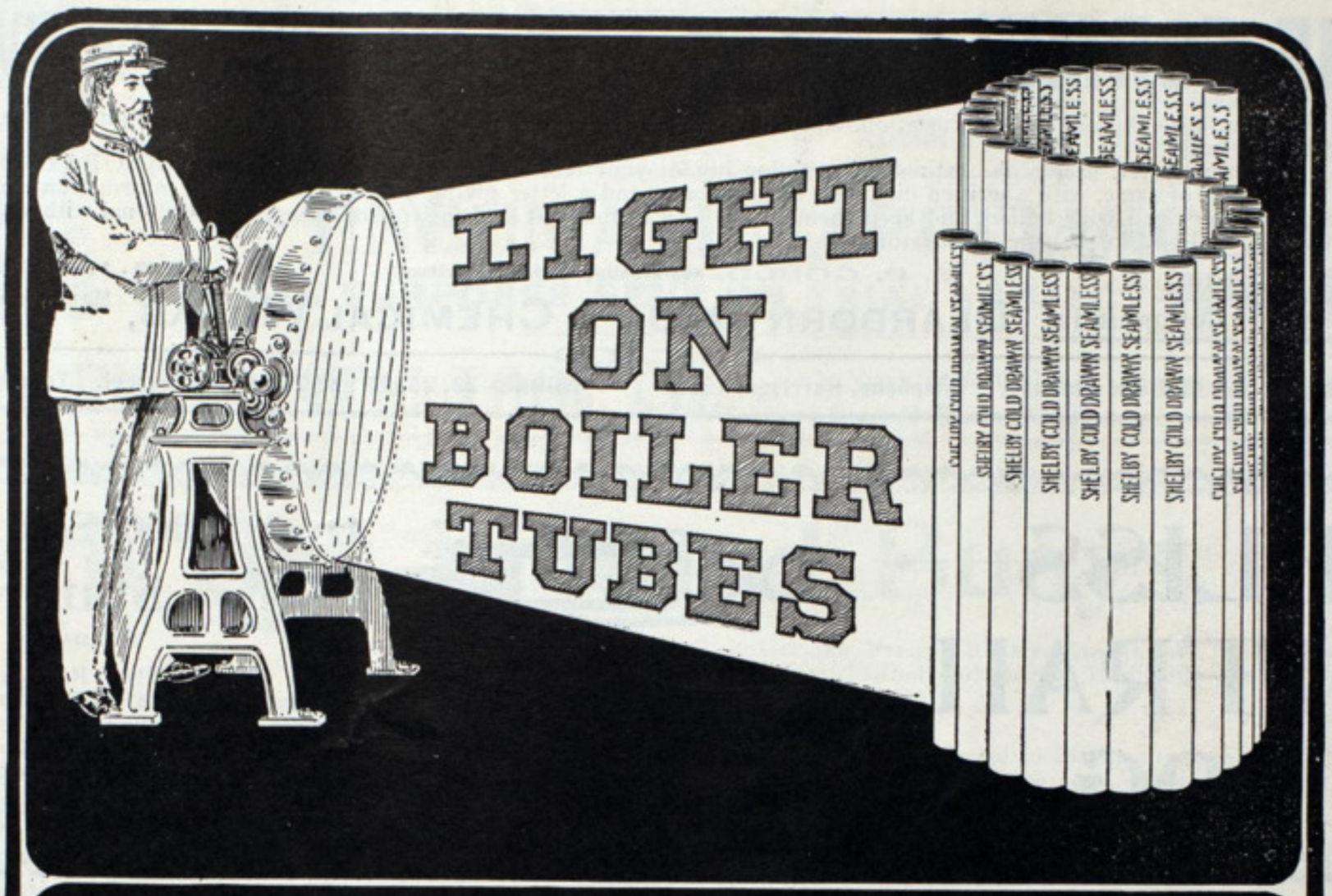

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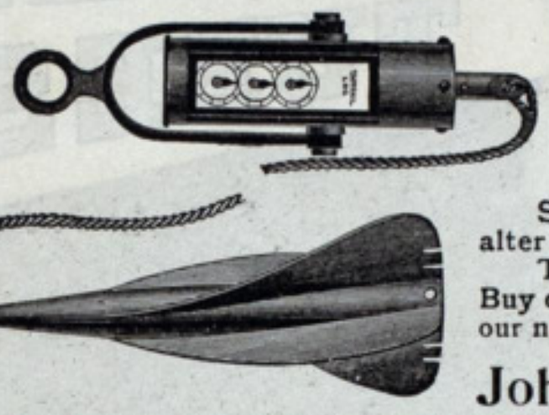

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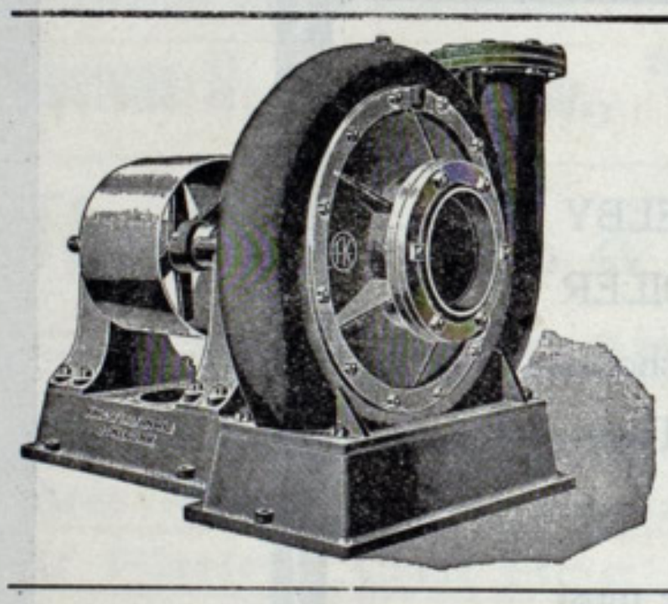

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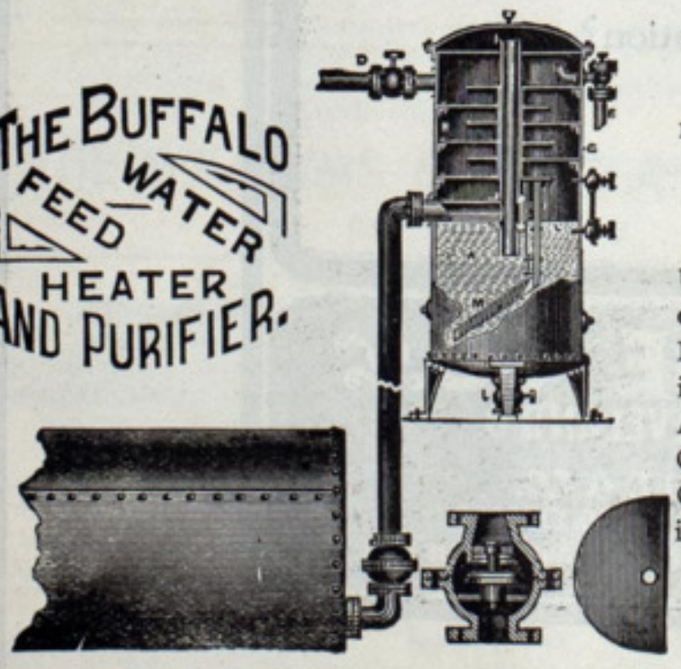

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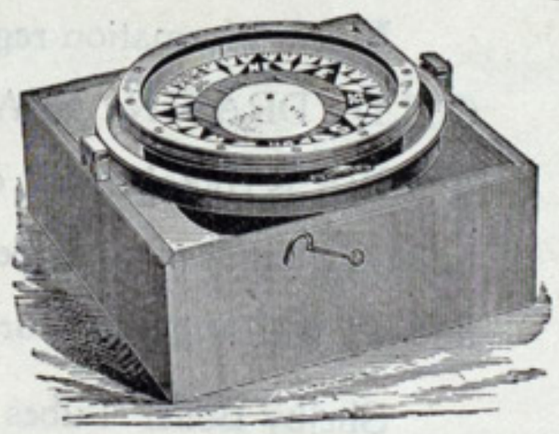

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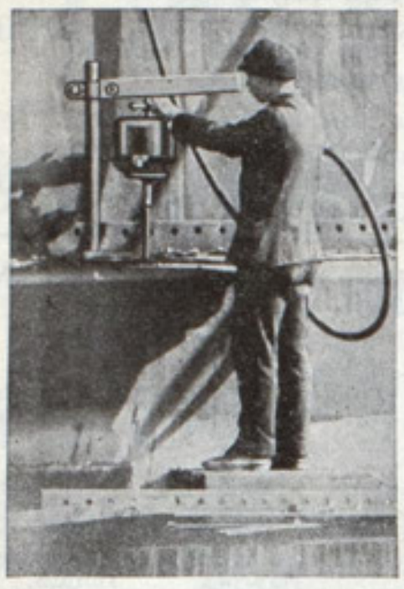

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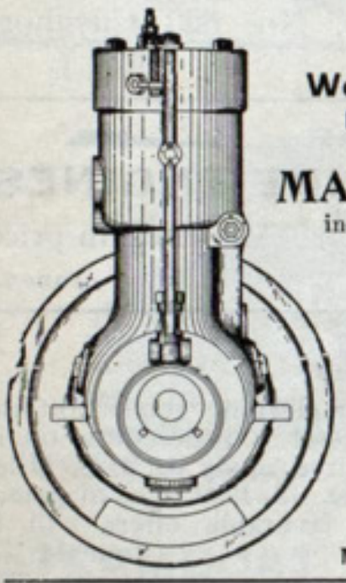

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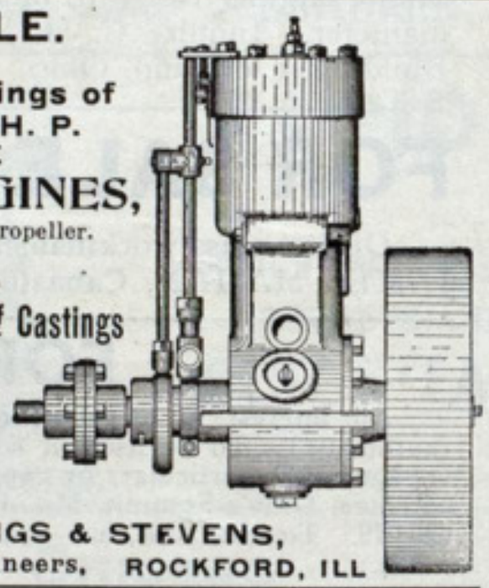

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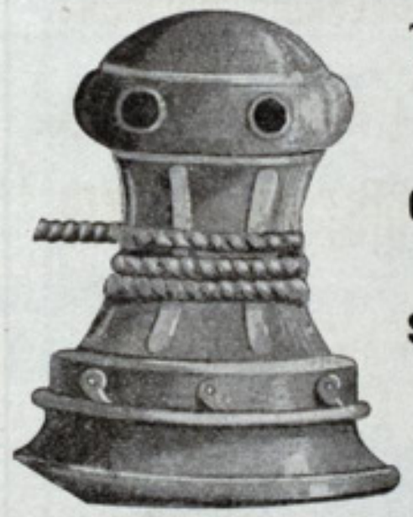

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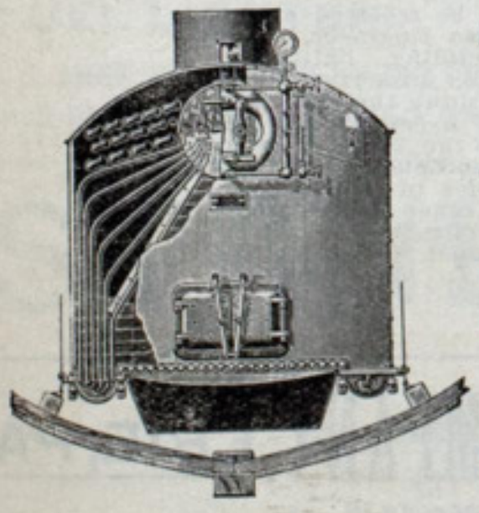

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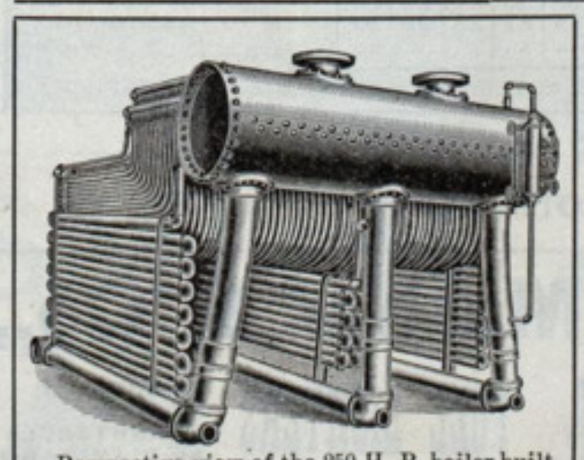

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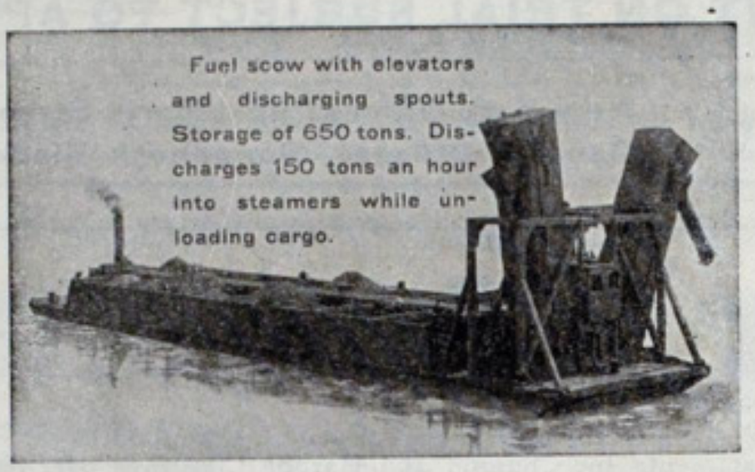

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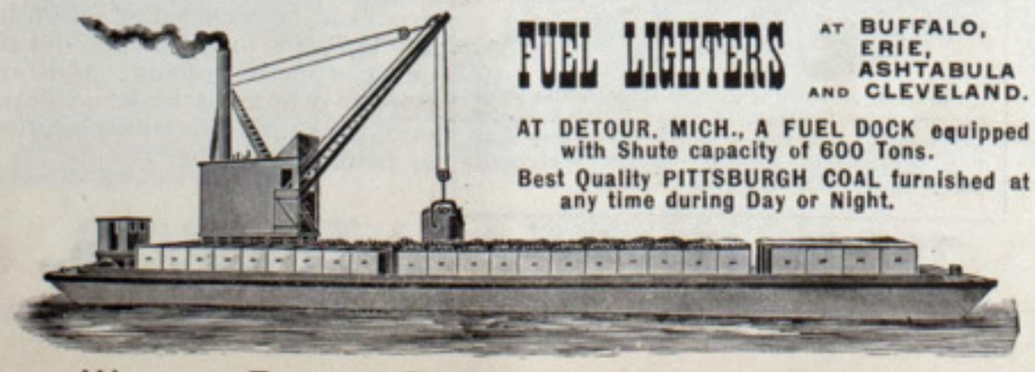

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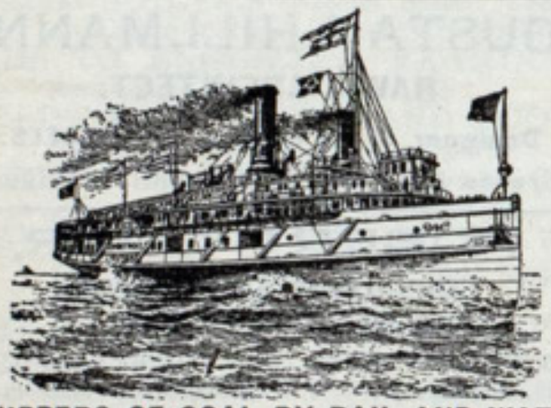

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Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co....Buffalo.
Scott Co., W. L.....Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson. Geo. A.....Sault Ste. Marie, Mich.

COPPER AND SHEET IRON WORK.

Pusey & Jones Co.....Wilmington, Del.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Donohue & Co., John T.....Baltimore.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia.

DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co.....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Sprague Electric Co.....New York.
Sturtevant, B. F Co.....Boston.
Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Simpson, W. L.....5th and Buttonwood, Philadelphia.
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

FLUSHOMETERS.

Kenney, The Co.....New York.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co.....Cleveland.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Donohue & Co., John T.....Baltimore.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Jenkins Bros.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn & Co., F. H.....Chicago.
Pauly, H. J.....Milwaukee.
Parker & Millen.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

LAUNCHES—NAPHTHA, ELECTRIC.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

LIFE BOATS—METALLIC.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

LUBRICATING PUMPS.
Manzel Bros.....Buffalo.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

MACHINE TOOLS (WOOD WORKING).
Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.
Mechanical Fabric Co.....Providence, R. I.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

PLANING MILL MACHINERY.
Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Case, A. Wells & Son.....Highland Park, Conn.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Donohue & Co., John T.....Baltimore.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Long & Allstatter Co.....Cincinnati.
New Doty Mnfg. Co.....Janesville, Wis.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCREW MACHINES.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co.....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SLING FRAME FOR HANDLING BARRELS
Patriarche, H. R.....Milwaukee.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.
Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Donohue & Co., John T.....Baltimore.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee

STOKERS FOR MARINE SERVICE.
American Stoker Co.....New York.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
Berlin Iron Bridge Co.....East Berlin, Conn.

SURVEYORS, MARINE.
Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THRUST COLLARS FOR PROPELLER SHAFTS.
Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.
Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
Long & Allstatter, The Co.....Hamilton, O.
New Doty Mnfg. Co.....Janesville, Wis.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.
Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.
Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING, STEEL, COPPER AND BRASS.
Atlantic Tube Co.....Pittsburg.
Hungerford Brass & Copper Co., U. T...New York.
Merchant & Co., Inc.....Philadelphia.
Shelby Steel Tube Co.....Cleveland.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.
Smith, Edward & Co.....New York.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.
Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.
Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.

YACHT, MARINE AND SHIPS' BELL CLOCKS.
Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

Almy Water Tube Boiler Co. 11
American Line 7
American Ship Building Co. 1
American Ship Windlass Co. 2
American Steam Gauge Co. 1
American Steel & Wire Co. 1
American Stoker Co. 3
American Tool Works Co. 24
Armstrong Cork Co. 40
Ashton Valve Co. 12
Atlantic Works 5
Atlantic Tube Co. 8

Babcock & Wilcox Co. 11
Baldt Anchor Co. 9
Ball Bearing Co., Boston, Mass. 1
Baker, Howard H. & Co. 9
Bath Iron Works, Ltd. 1
Bement, Miles & Co. 10
Berlin Iron Bridge Co. 6
Bertram's Oil Polish Co. 1
Bessemer Steamship Co. 28
Bethlehem Steel Co. 6
Big Four Railway 39
Blake, Geo. F., Mnfg. Co. 9
*Bliss, John & Co. 30
*Bloomsburg & Co., H. 31
Boland, J. J. 34
*Boston & Lockport Block Co. 40
*Boyer Water Tube Boiler Co. 31
Bourne-Fuller Co. 12
Brown & Co. 34
Brown Hoisting & Conveying Mach. Co. 2
Buffalo Dry Dock Co. 27
Buffalo Forge Co. 12
Bull & Co., A. H. 34

Calvin Co., The 1
Case, A. Wells & Son 28
Castner, Curran & Bullitt 33
Champion Rivet Co. 28
Chase Machine Co. 6
Chelsea Clock Co. 39
Chicago Pneumatic Tool Co. 31
Chicago Ship Building Co. 2
*Cleveland Punch & Shear Works Co. 30
C. C. C. & St. L. R. R. 39
Conners, W. J. 34
Cole & Kuhls 7
Continental Iron Works 2
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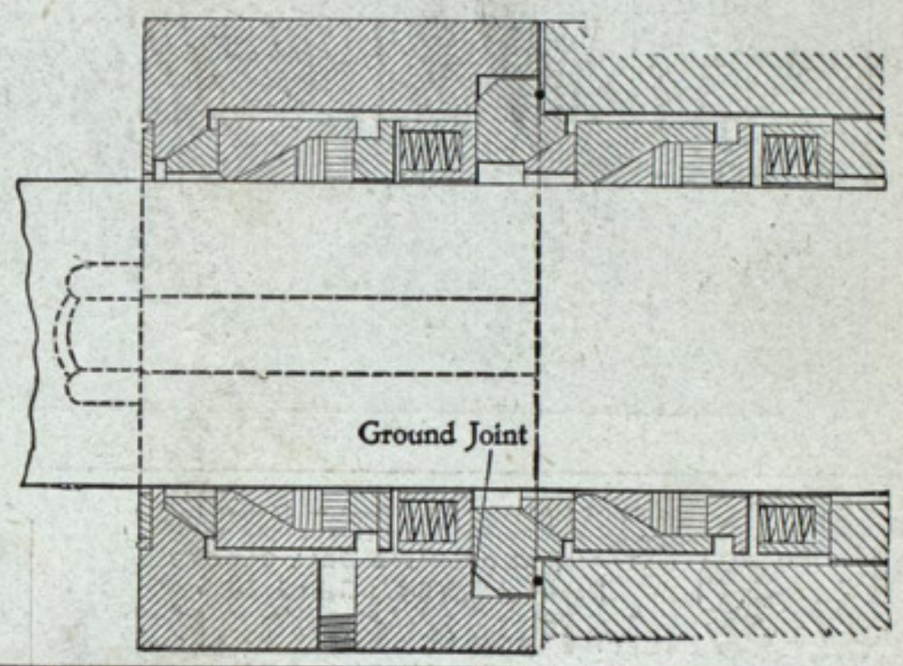

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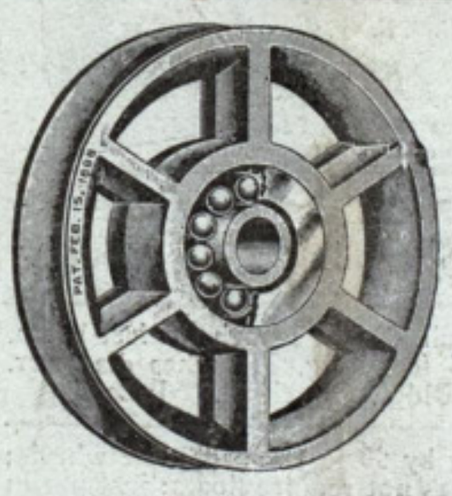

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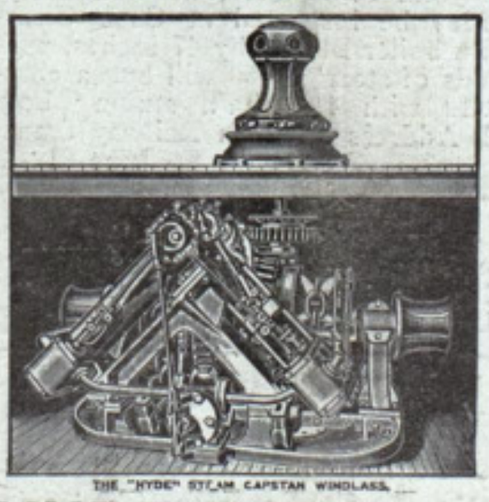

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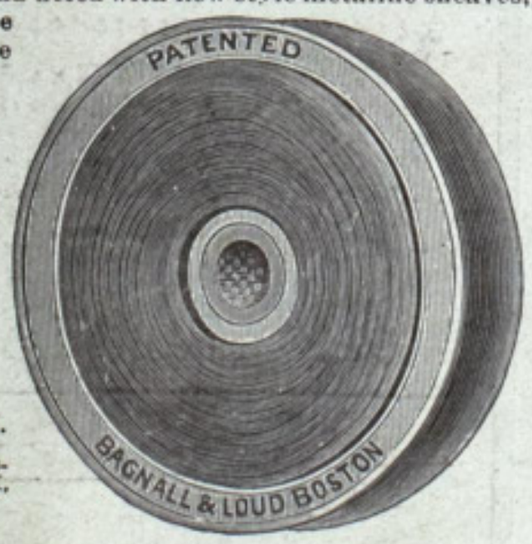

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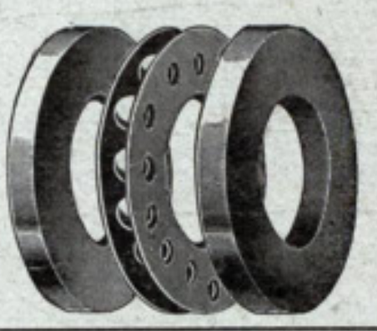

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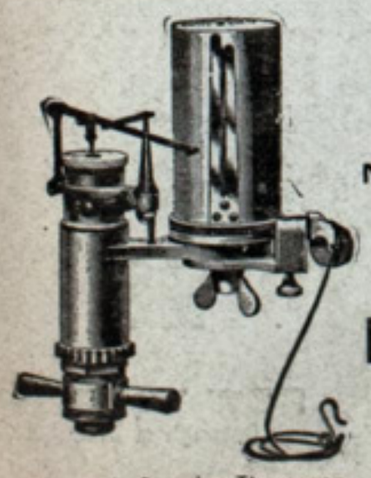

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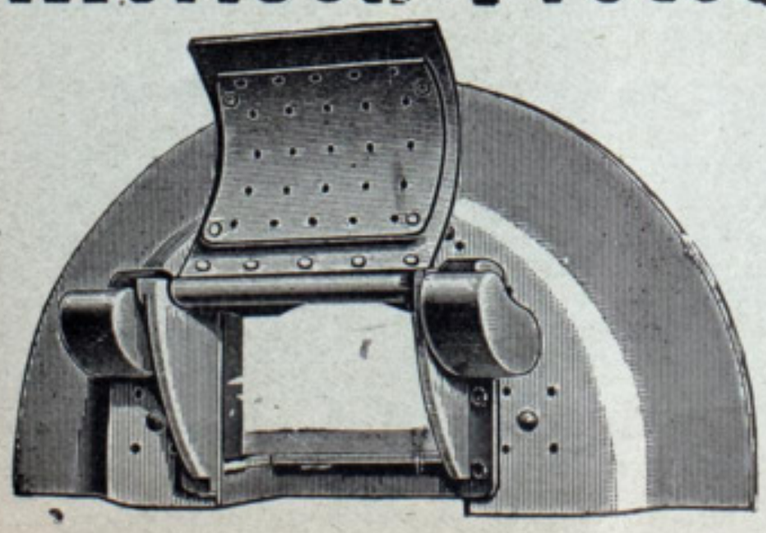

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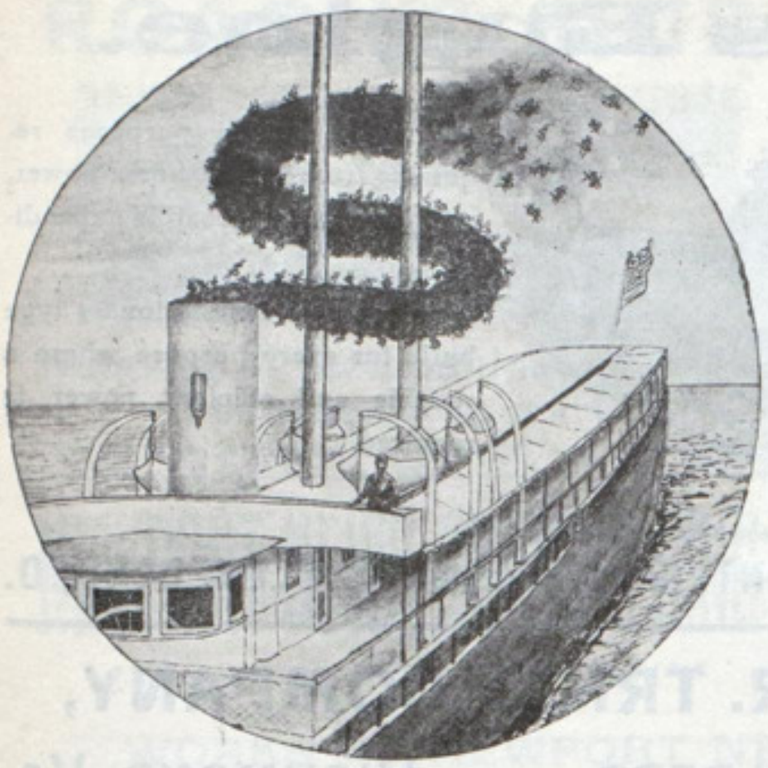

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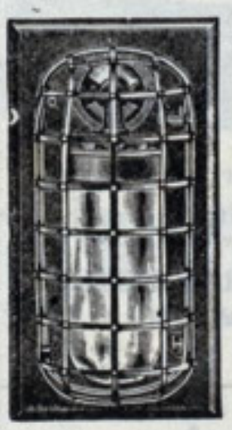

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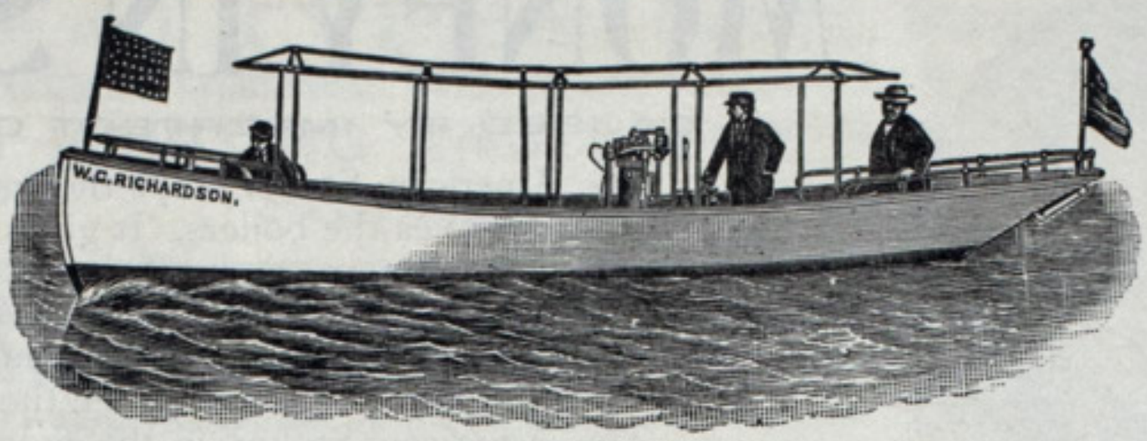

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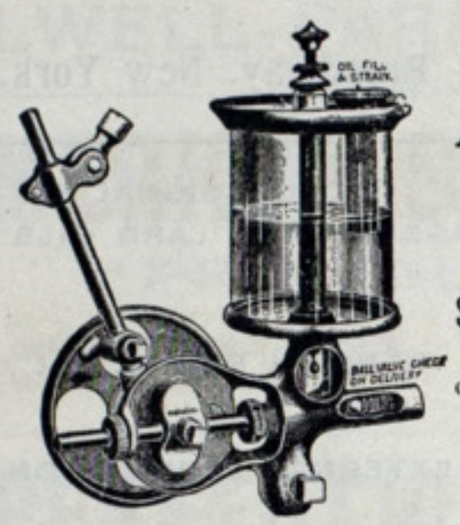

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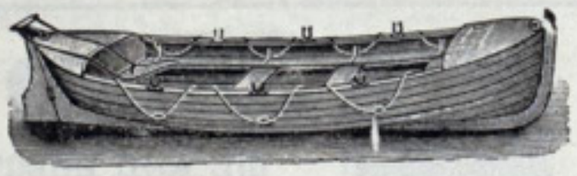

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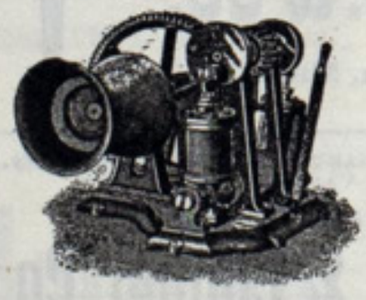

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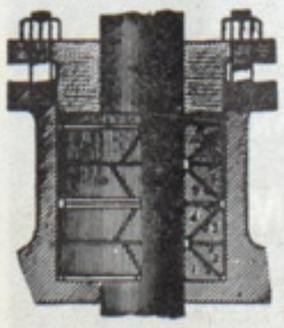

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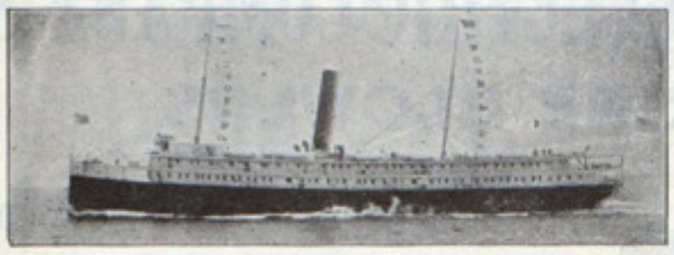

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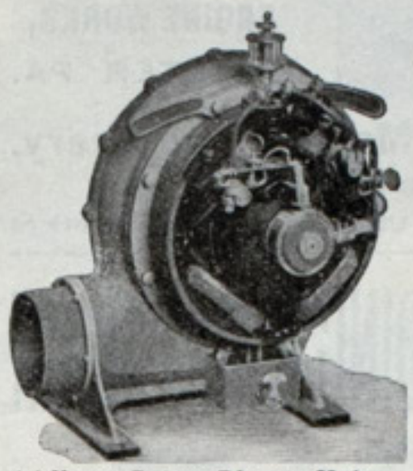

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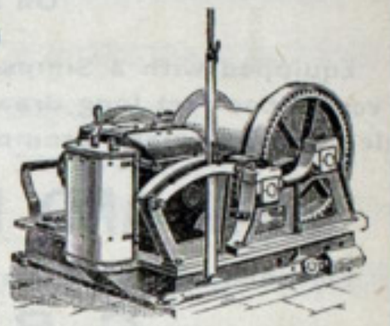

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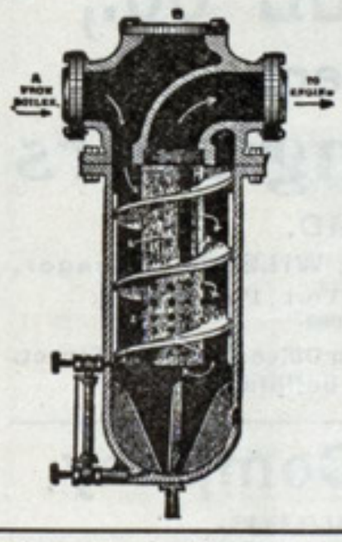

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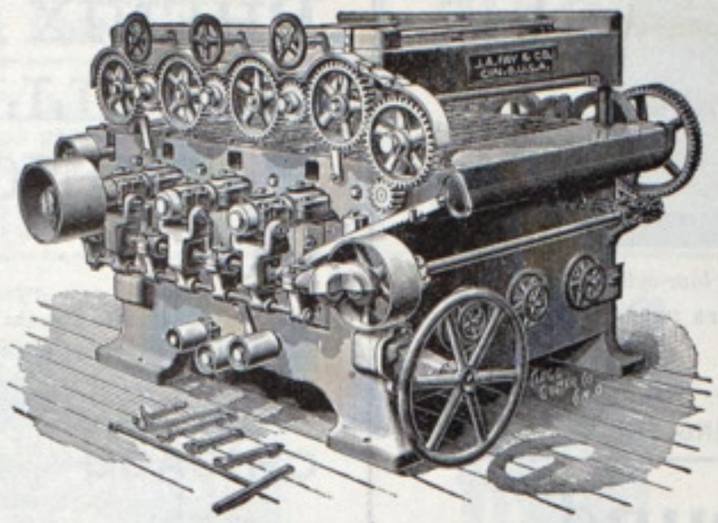

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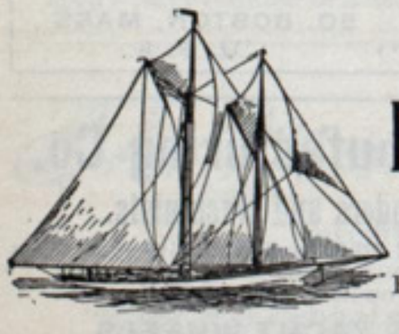

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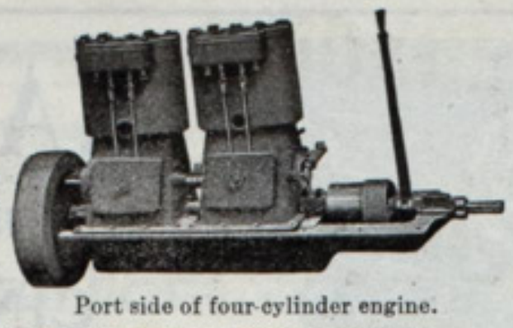

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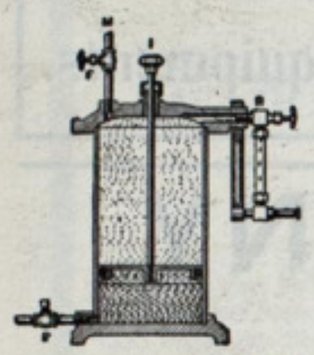

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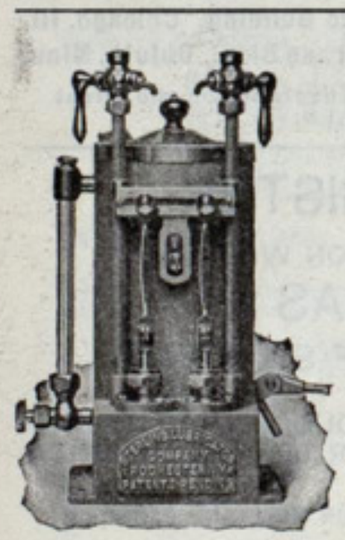

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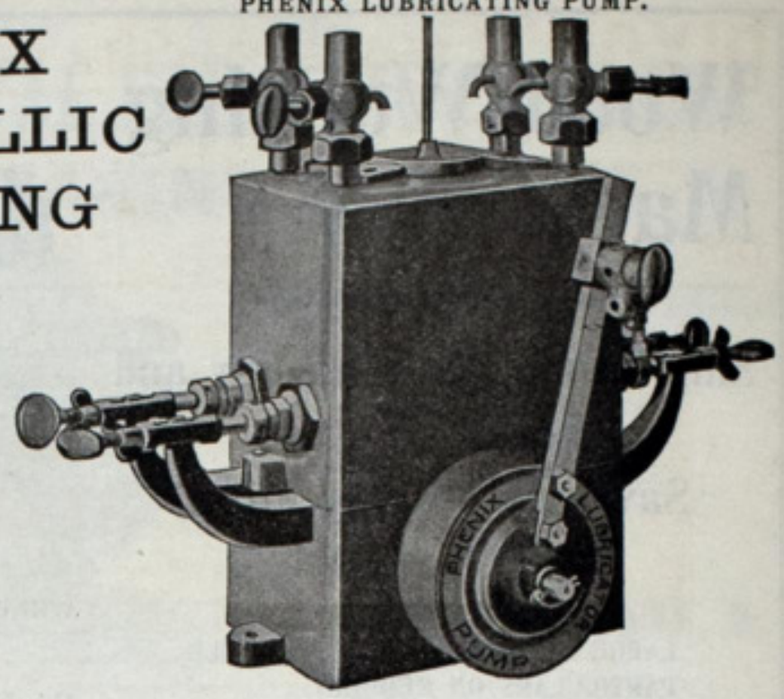

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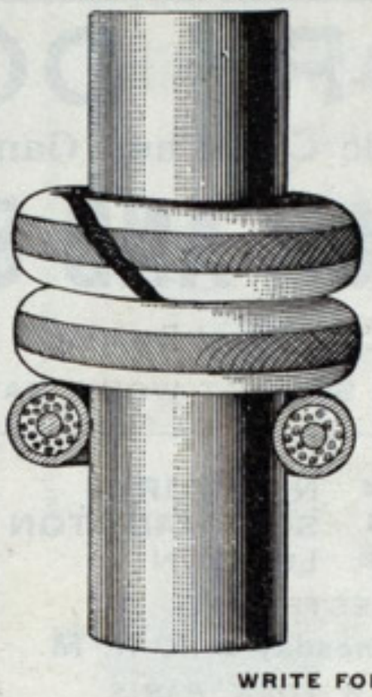

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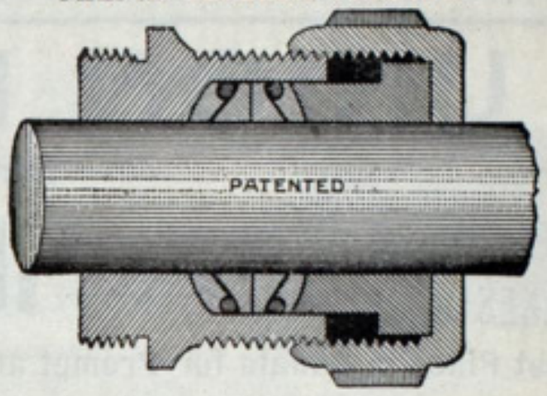

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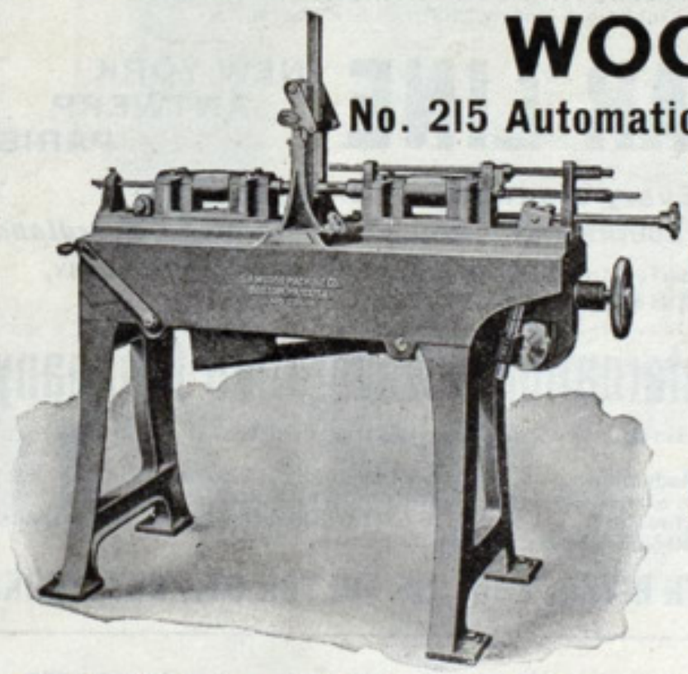

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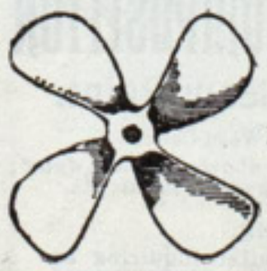

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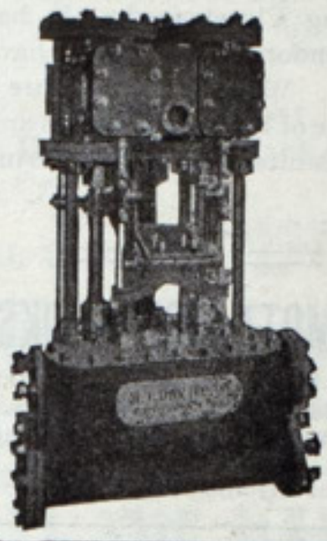

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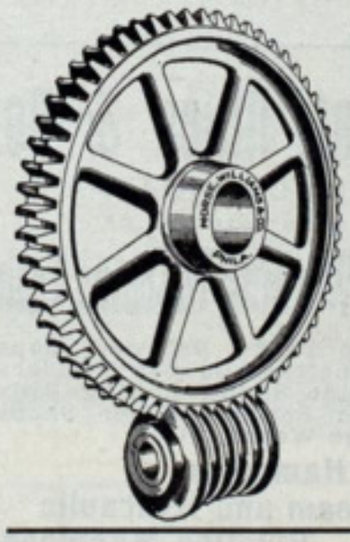

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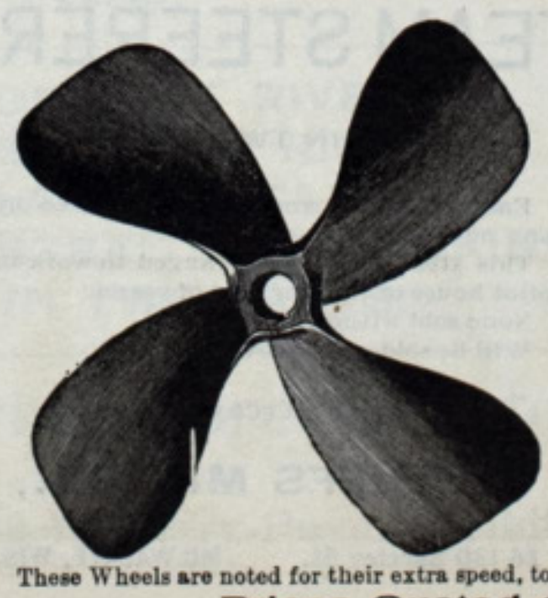

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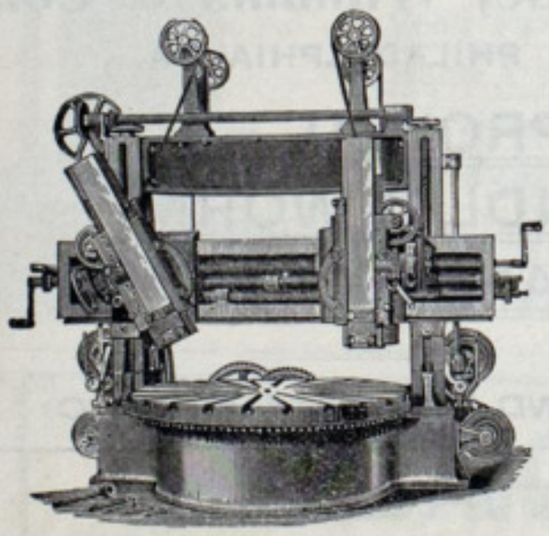

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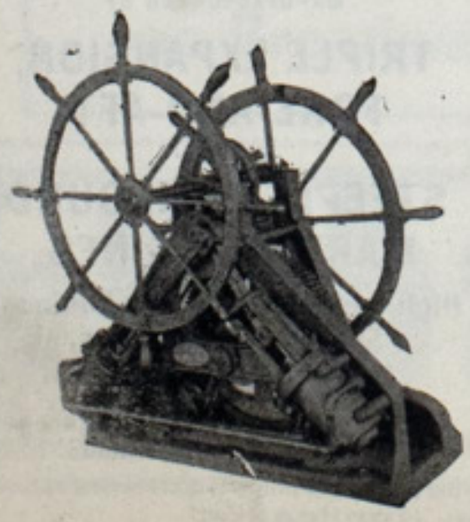

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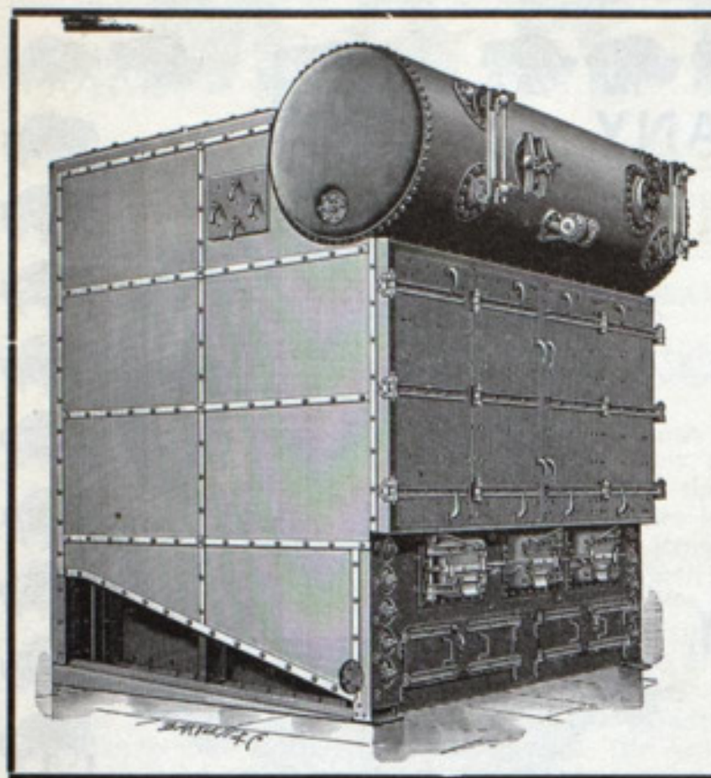

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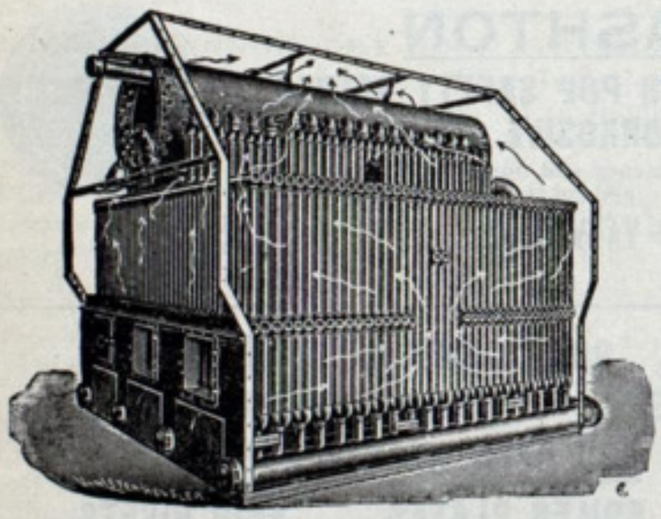

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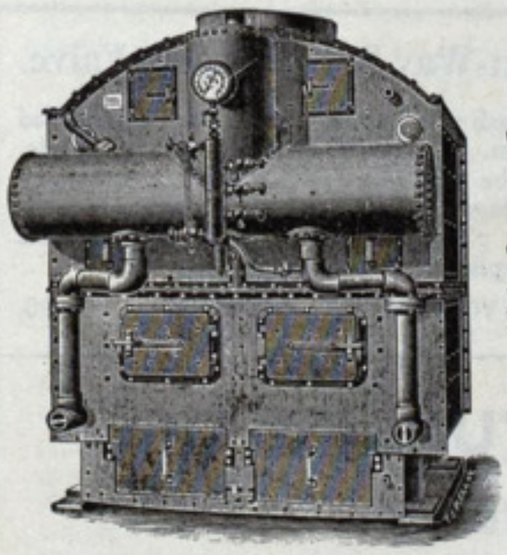

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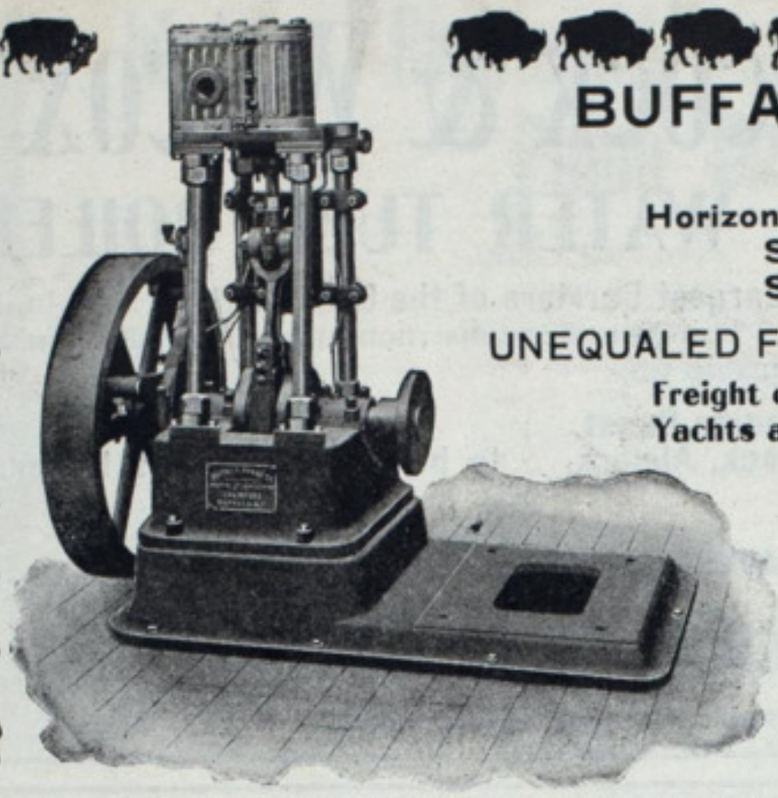

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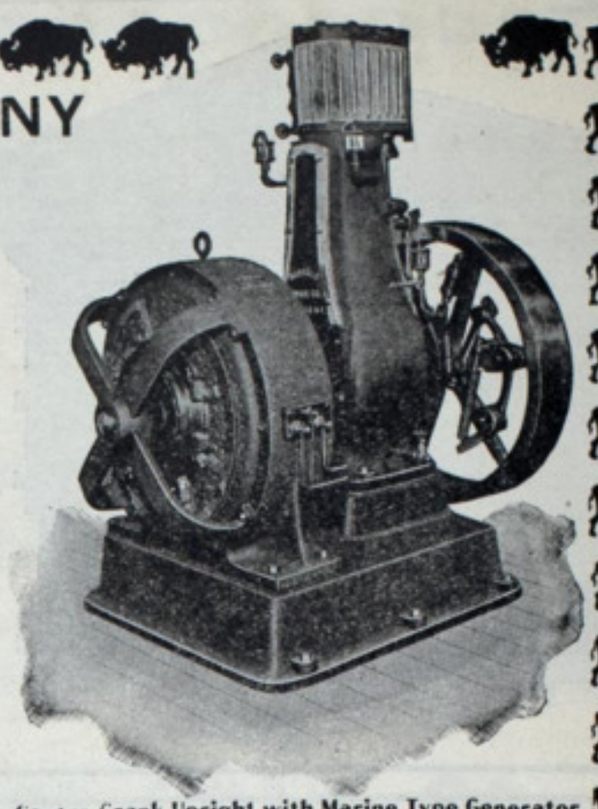

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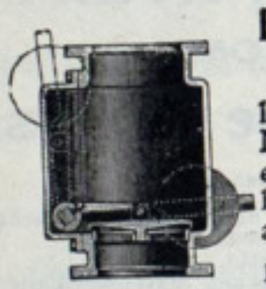

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